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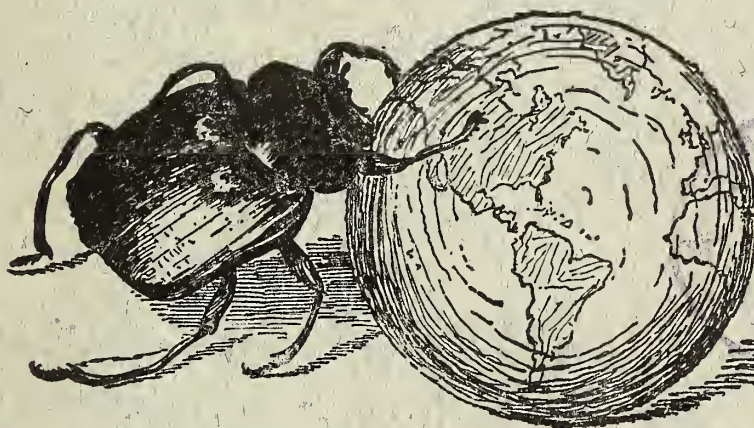
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No. 1

THE INSIDE HISTORY OF NORTH AMERICAN MYIOLOGY¹

BY CHARLES H. T. TOWNSEND

ITAQUAQUECETUBA, SAO PAULO, BRAZIL

The history of this subject in the United States has unfortunately been characterized by a petty spirit of rivalry and jealousy for the past three decades. This, perhaps the most difficult subject as regards taxonomy, meriting on this very account the most concerted and amicable relations among its students, has met with the exact opposite during its development in North America.

Say was among the first to describe muscoid forms of this fauna. He was accompanied and followed by various European students, among whom Desvoidy, Wulp, Macquart, Walker and Bigot are conspicuous. Wiedemann and Loew described certain forms. Osten-Sacken and Williston contributed in America, especially Williston. Such were the beginnings of muscoid taxonomy in North America up to the year 1888, marked thus far by no spirit of rivalry or jealousy on this side of the Atlantic. The jealousy shown by Macquart for Desvoidy belongs on the other side.

When Riley wished the Diptera on Townsend in 1888, he conferred on the latter a lasting favor but a legacy of petty annoyances. Townsend had been devoted to the Coleoptera, but had

¹ The word myiology is here coined to designate the study of the muscoid flies or superfamily Muscoidea, which comprises the old calyptrate series exclusive of the Anthomyioidea.

later developed a very special interest in the Heteroptera; the Diptera had attracted him not at all up to that time, and would have formed his very last choice. But there was no one in Washington at the time to attend to this order of insects, while the other orders were already allotted. Therefore Townsend, conforming to the wish of his chief, began work on the Diptera, and was attracted almost from the first by the muscoid forms. For Riley's part in this matter, Townsend has been most grateful, for no other possible group of organisms could have proved so fecund of interest in his eyes, considered from all points of view.

It appears that, quite unknown to Townsend, Coquillett had conceived an interest in the muscoid groups at about this time, but had so far published nothing. Being in California on economic work, and removed from both collections and complete literature, Coquillett had little opportunity to indulge his desire for study of the subject. He chafed under the restriction and developed a bitter hatred of Townsend and his work; a hatred which he nursed diligently until his death, and which prohibited him even from conversing with Townsend except under circumstances of the direst necessity.

At the first opportunity that offered, Coquillett secured a transfer to Washington and plunged into the study of the so-called Tachinidæ, the result being his memorable "Revision" which appeared in 1897. In this publication, he was unsparing of his contempt for Townsend and his work, throwing into the synonymy every genus and species that Townsend had described up to that time that offered the least plausibility for such action. He indulged his hatred of Townsend here to the utmost, and doubtless secured an overwhelming satisfaction in so doing. At the same time he possessed but a poor eye for muscoid characters and a small judgment of their value, and was thus quite unconscious of the precariousness of his footing in the stand he had taken. His pronouncements, like the whole fabric of his work, are falling apart and away as investigation progresses in the groups he treated.

During all of this time and up to the last, Townsend harbored no animosity toward Coquillett and would have been glad at any

time to converse with him on muscoid work, but found him so unapproachable that he would not even answer questions couched in the most courteous terms and offered in the most friendly spirit. The animosity of Coquillett brought a handful of animosities in its train.

In the succeeding years up to 1905, Aldrich had been compiling his catalogue of North American Diptera, having been a general student of the Diptera and a special student of the Dolichopodidæ for some years but having done nothing with muscoid forms. His fatal mistake was in following Coquillett almost blindly as to muscoid synonymy in his catalogue. But, knowing little of the subject himself, he was easily led by the apparent simplicity and plausibility of Coquillett's treatment to fall into this error. His catalogue was published before Townsend had an opportunity to go thoroughly into the subject of Coquillett's "Revision" and expose its manifold errors hidden in the guise of plausibility.

Aldrich repeatedly ridiculed Townsend in his catalogue, and compromised himself so far in his attitude toward Townsend's work that he felt he could not gracefully retract after the latter began to point out in a wholly impartial manner the errors that had been perpetuated in the catalogue. Here was the birth of a second bitter hatred toward Townsend, as is abundantly proved by the acrid remarks in the notice of Williston's book by Aldrich in *Science* in 1908, to which Townsend published no reply.

Coquillett, shortly before his death, by the judicious exhibition of a little affability toward Walton and Thompson, made them his fast friends and particularly won the heart of Walton, who became his staunch defender. As witness of this last fact, the article by Walton in the JOURNAL OF THE NEW YORK ENTOMOLOGICAL SOCIETY in 1914 may be cited, indulging in ridicule to which Townsend did not deign to reply. Here was born a third hatred of Townsend which became very bitter until it was fortunately dispelled a few years later.

About this time, Aldrich, in a desire to vindicate himself and pose as a muscoid student, presented a paper before the 1914 meeting of the Entomological Society of America with the title

"25 Years of Muscoid Collecting," in which he still followed Coquillett's synonymy; and then, in 1916, published his book on sarcophagids. Aldrich had early committed himself to broad specific limits and unrestricted genera throughout the Diptera and was unable to renounce them; rather was he anxious to display them, and he further committed the mistake of approaching the sarcophagids from the male end, a group particularly fitted for investigation from the female end.

A comparison of Aldrich's new genera with the complex which he retained under *Sarcophaga* reveals the utmost discrepancy in generic limits. His union of the sexes was in numerous cases wrong, as he had no sure data at his command and refused to accept valuable characters already pointed out by Townsend, as well as certain important muscoid taxonomic principles. On his accession to the staff of the U. S. National Museum, he has pursued practically the same course, though gradually forced to acknowledge the mistakes of Coquillett, which he has done as apologetically as possible to the latter. But his animosity toward Townsend crops out in all his published writings, his criticism of Townsend's work being always showy and biting. He goes out of his way to compliment the work of others; but anything bearing the Townsend stamp meets with his immediate disapproval and, if he can not find some way to attack it, gets by with a mere mention, or often none at all.

Brauer, with a rare taxonomic insight, was the first muscoid student to point out definitely and explain the fact that in these groups restricted categories are absolutely essential to clearness of treatment, a fact which Townsend recognized from the first and elaborated still further. Desvoidy recognized this fact a century ago and both commented and acted on it, but did not explain it so fully as did Brauer. Knab also recognized this fact, as shown by his 1914 paper at the Entomological Society of America meeting. Aldrich refuses to admit this very outstanding and well defined principle.

In a letter to Townsend, dated May 8, 1924, Aldrich wrote concerning the paper by Webber and himself on the *Phorocera-Exorista* complex of Coquillett in the Proceedings of the U. S.

National Museum for 1924 as follows: "You will not like it, because we did not recognize enough genera to suit you. I am responsible for the generic arrangement, which cost me an immense amount of work and study." Referring to the last sentence, Townsend replied in substance as follows: "Your remark is highly significant. Instead of wasting time in an attempt to extend generic limits arbitrarily where they do not naturally fall, it is far wiser to strike a generic arrangement that shall be fairly simple and easy to follow out. Restricted genera, concisely defined, attain the greatest simplicity of treatment possible."

Aldrich replied to this under date of August 2, 1924, as follows: "It would be useless to undertake any general discussion of the limits of genera. I have, as I freely admit, much difficulty in determining them. You solve the problem by making a genus for almost every species, but you encounter precisely my difficulty when you start to group these genera into tribes. So you are no better off than I am, and I am trying to classify muscoids as nearly as possible on the same lines as other animals. I never did take any stock in your oft-repeated belief that muscoids require a different taxonomy."

The fallacy of the above argument is evident; tribal divisions, being far less numerous than generic, involve far less doubt in the final analysis. In those few cases where doubt as to tribe may arise, it is only necessary to run the fly through the tables for the tribes concerned; there will be no doubt about the genus when you reach it, if it is concisely defined in its restricted sense. By the other system, there will be no certainty about the genus, because of its loose definition, and the student will be quite unable to decide between numerous genera.

Townsend, realizing the immense number of undescribed muscoid forms and anxious to provide restricted genera for their accommodation as quickly as might be, customarily described but one species in a genus to serve as genotype, leaving various other species for future description. This custom has given rise to the idea, assiduously cultivated and advanced by Aldrich, that Townsend made a genus for every species. Nothing is

wider of the mark, for Townsend found numerous species of many of his genera but left them undescribed. It is safe to say that the restricted muscoid genera, as defined by Townsend, will average at least 5 species each. Some will be found monotypic, but other will carry from 10 to 20 species if not more.

The work of Aldrich is destructive rather than constructive. He is attempting to relegate to the synonymy as many of Townsend's restricted muscoid genera as possible, with the sole aim of vindicating his own original commitment to broad categories. It is a pity that he is so unreceptive to progressive ideas and holds so stubbornly to long-exploded concepts. He refuses absolutely to change his ideas in the light of new facts. It is evident that his work will suffer proportionately in consequence. He has a better eye than Coquillett had for muscoid characters, but he persists in ignoring important characters which Townsend has pointed out, partly from prejudice and partly from the difficulty of interpreting them.

Among these characters are the reclinate fronto-orbitals, which he refuses to differentiate from the frontals, though comparative studies of them show beyond all doubt their distinctness. In some forms, it is difficult to distinguish them in full, due to their number or variability. He attaches no importance to the geno-orbitals. Important clypeal characters he passes over, being unable to grasp them; and the same may be said of epistomal characters. Facial in relation to frontal widths he fails to notice. The height as compared with the breadth of the head is ignored. Frontal, facial, oral and occipital profiles in comparison with each other he does not mention. The exact characters of the facialia and parafacialia he omits, likewise the comparative width of the frontalia in each sex. Aristal characters are not clearly defined. His expression of venational and other wing characters is too loose to be serviceable. He pays no attention to the relative lengths of the prescutum and postscutum, nor to the form of the abdomen. The comparative size of the squamae and squamulae is disregarded. All of these characters are of generic, and some are of tribal importance. These are by no means the only important characters ignored by Aldrich. It is

usually quite impossible to place a genus in its proper tribe from his description of it. He does not know the groups sufficiently to grasp the salient characters and his remarks on relationships reveal his inexperience.

Townsend has been making detailed studies of South American muscoid forms for 15 years, and has in manuscript many diagnoses of new and old forms awaiting publication, founded on abundant material of his own collecting. Aldrich, however, with often only a single poorly preserved specimen of one sex, in groups where the two sexes are quite necessary to correct determination, is broadcasting "obiter dicta" on synonymy of genera and species both North and South American, with insufficient evidence and little experience to go on. With only a superficial knowledge of the Muscoidea, being practically but a beginner in the superfamily, without the aid of dissections and refusing absolutely to accept anything conflicting with his preconceived ideas, he is making innumerable positive statements as to synonymy of forms and identity of specimens in all groups. These statements are made with an assurance that is surprising. An experienced student of these groups would never commit himself so positively and irrevocably, without having first dissected the forms in question. It illustrates the old maxim that "fools rush in where angels fear to tread." This would be amusing but for the fact that the high assurance exhibited and the authoritative pose adopted tend to carry conviction to the unsuspecting onlooker.

If Aldrich is forced to admit that he does not understand a group, he contents himself with the statement that it contains a greatly confused mass of genera, not realizing that the confusion is all in his own head. The numerous dicta put forth by Aldrich would be interesting if true, but the trouble is that no dependence can be placed on them. They are simply the individual prejudiced opinions of a man who is unable to learn because he will not keep a receptive mind. It must be remembered that there are generically distinct muscoid species which are so similar in external characters, even as to chætotactic details, that, placed side by side under the binocular, they would

without previous dissection require much careful comparison by the most expert student of these groups in order to establish their specific distinctness! Such forms Coquillett and Aldrich would unhesitatingly pronounce the same species.

At the same time, Aldrich is attempting to trace in the U. S. National Museum collection various supposed acts and omissions on the part of Townsend and is publishing them as rapidly as he can, always calling attention to them in a deprecatory manner, telling in detail how it all happened—doing sleuth work in tracing the mental processes of Townsend as judged apparently by his own. In self defense, Townsend has had to publish details of the work he did on the collection while he was honorary custodian of it, and the exact condition in which he left it in March, 1919, so that the incorrectness of these numerous imputations may be recognized. And this in spite of having explained to Aldrich, both verbally and in writing, the exact conditions.

Aldrich pays no attention to Townsend's verbal, in-litteris or even published statements if they conflict with the concept which he wishes to present, but arranges the setting of his remarks to suit himself regardless of fact or circumstance. Worse still, facts are often distorted either to reflect against Townsend or to credit others for what he has done. It would be charitable to infer that all this is due to failing memory rather than to malice aforethought, but the question may be left open.

Thompson and Walton have dropped out of the muscoid work, so far as taxonomy goes; and so also has Harrison E. Smith, who bid fair to be a very careful muscoid student, receptive to modern ideas of taxonomy. Tothill has declared himself a lumpener of genera.

The extensive work of Brauer & Bergenstamm, which included very many North American forms sent them by Riley prior to 1888, as well as various Mexican forms from other sources, has scarcely been mentioned in the above account. They dealt impartially with the work of Townsend. Williston and Osten-Sacken were both most friendly toward Townsend and his work, and both recognized the very inferior character of Coquillett's work; in all of which they were supported by Knab, who was a student of unusual ability and breadth.

Villeneuve and Bezzi, the main European muscoid students of today; Austen, who did valuable work on Walker's types, Patton and Awati, who have done high-class work on Oriental *Stomoxys*, have all given Townsend full and impartial credit for his work.

Hough began work on the lower muscoid groups many years ago but abandoned it shortly; his published work is of such a high character that it is greatly to be regretted he did not continue.

Townsend harbors no animosity toward any one, for life is too short to waste in animosities. He writes this himself, standing off as a detached and impartial observer, contemplating his own work as though it belonged to another, and exposing this inside history only in the interests of fair play and a square deal. His main interest throughout has always lain in the broader aspects of the subject, and has included taxonomy only in so far as it conformed to relationships and provided means for positive determination of forms. His *Manual of Myiology*, still in manuscript and now for some years practically completed, is being constantly enlarged and revised by the study of new material and will eventually be published in several volumes, dealing with all aspects of the subject.

The extended studies prosecuted by Townsend on the internal reproductive systems of both sexes, the eggs and the larvae have for the first time opened the way to a sound taxonomic treatment of the Muscoidea. Thousands upon thousands of dissections of both sexes have been made, and great numbers of drawings have been on hand for from 3 to 15 years. The alimentary system has also been studied in various groups. Complete synoptic tables of the genera of the world have been in manuscript for several years, arranged in over 100 tribes. There are numerous instances of very distinct forms which seem almost alike on external characters. It only requires dissection of the females to demonstrate the fact that the slight external characters by which they differ carry generic value. Only after one has made extended series of dissections in all groups and correlated the results with the external characters can he be certain

of his determinations. But once this work has been done and the value of the external characters duly established, it is not necessary to repeat dissections for positive determination.

Such is a brief outline of the work on muscoid taxonomy in North America to date, involving also recent work in South America. Younger students are arising, from whom we may expect much. Let them keep an open mind, for a closed mind is a fatal fault in an investigator. Let them beware of prejudices and commit themselves only to a search for truth. They will then not be faced by the alternative of retraction, or continuance on a mistaken course.

THE NEW YORK STATE LIST OF INSECTS

It is gratifying to announce that the compilation of the proposed List of the Insects of New York State is now to be completed. Dr. M. D. Leonard, who was appointed Editor-in-Chief while Acting State Entomologist of New York, returned to the Department of Entomology at Cornell University, Ithaca, New York, December last to again take charge of the project. His entire time will be devoted to the completion of this list and the New York State College of Agriculture has promised publication provided the manuscript is ready by June 1, 1925.

It is estimated that over 16,000 species will be listed as occurring in New York, together with as complete distribution data within the State as is known for each species. Several orders are already completed. Over one hundred of the leading specialists are actively cooperating. The editor of the List will greatly appreciate definite New York State records in all groups and will see that full credit is given to every cooperator.

A SYNOPSIS OF THE STREBLIDAE OF THE WORLD

BY QUINTA CATTELL KESSEL

This study of the Streblidæ was begun at the University of Cambridge in 1923, under the kind and painstaking direction of Dr. Hugh Scott, Curator of Entomology. As the work progressed, it assumed proportions not dreamed of in the beginning, and when I returned to this country, I decided to compile a synopsis of the family. Through the kindness of Dr. Scott, I have had the loan of the specimens belonging to the Cambridge University Museum. Mr. F. W. Edwards has generously sent me most of the material of the British Museum, and Dr. J. M. Aldrich and R. C. Shannon have loaned me what specimens they could from the National Museum. I am greatly indebted to all of these for the assistance they have given me, and also to certain members of the staff of the Department of Entomology at Cornell University, particularly Professor O. A. Johannsen, who gave many suggestions for carrying on the work.

The family Streblidæ was erected by Wiedemann in 1824 and it is still a small one, but judging by the results of comparatively recent collecting, it is destined to grow considerably.

Except for one known species, *Strebla avium*, which infests doves and parrots, the Streblidæ are all parasitic on bats in more or less tropical regions. The only record from a mammalian host other than a bat is one from an opossum, *Glironia venusta*. They have been recorded from the southern boundary of the United States, from Mexico, Central and South America, Africa, Palestine and India. Exceptions to these are records from Colorado, Kansas and Spain.

Very little is known about the life history. Kolenati, 1856, believed them to be oviparous, the larvæ living in the excrement of bats, but it seems likely that he found some other kind of larvæ, since a number of workers have found mature Streblid larvæ in the distended abdomens of the females. The wide range of structural adaptations is at least indicative that there

may be considerable variation in the mode of living of the different genera.

The Streblidæ may be easily differentiated from the Hippoboscidæ by the large leaflike palpi which project in front of the head and which do not form a sheath for the proboscis. They differ from the Nycteribiidæ in not having the head resting in a groove on the dorsum of the thorax, and except for two small genera, in the possession of wings. The Ascodipteridæ, which seem to be closely related, have a striking sexual dimorphism, the female having the proboscis curiously developed, and provided with strong curved blades, which she uses in imbedding herself under the skin of the bat. These four forms with the *Braulidæ* form the Diptera Pupipara.

Except in *Nycteribosca gigantea*, Speiser, color has not been used for distinguishing the genera or species, because it is very variable, some recently emerged specimens being remarkably pale, and improperly preserved specimens becoming almost black.

KEY TO THE GENERA OF THE STREBLIDÆ

- A. Without a ctenidium of strong, black spines on the ventral surface of the head Subfamily *Nycteriboscinae* Speiser
- B. Wings well developed.
 - C. Wings (Fig 16) with two and a part of a third well developed vein near the costal margin of the wings. Rest of the area with creases simulating veins. Apex with marked indentation. Thorax compressed *Nycterophila* Ferris
 - CC. Wings not as described in C.
 - D. Wings with six longitudinal veins.
 - E. Posterior legs not twice as long as the anterior ones.
 - F. Head flattened with large lateral lobes which fit in corresponding depressions in the thorax.
 - Pseudostrebla* Costa Lima
 - FF. Head convex and freely articulated with the thorax *Trichobius* Gervais
 - EE. Posterior legs about twice as long as the anterior ones.
 - F. Front femora with a diagonal row of massive spines *Paratrichobius* Costa Lima
 - FF. Front femora without a row of massive spines.
 - G. With a pair of strong teeth on the anterior margin of thorax, fitting into corresponding grooves in the back of head.
 - Synthesiostrebla* Townsend

- GG. Without the character described under
G *Speiseria* n. gen.
- DD. With less than six longitudinal veins.
E. Wings with five longitudinal veins.
F. Head and thorax highly convex. Head freely
movable. Eyes one-faceted.
Nycteribosca Speiser
- FF. Head somewhat flattened, lying close to the
thorax. Eyes lacking *Raymondia* Frauenfeld
- EE. Wings with four longitudinal veins.
Brachytarsina Macquart
- BB. Wings reduced or lacking.
C. Wings reduced.
D. Wings upstanding; narrow with distinct venation (Fig 15).
Posterior legs about twice as long as the anterior ones.
Pterellipsis Coquillett
- DD. Wings laid flat; short. Posterior legs not twice as long
as the anterior ones *Aspidoptera* Coquillett
- CC. Wings lacking.
D. Legs not twice as long as the anterior ones.
Paradyschiria Speiser
- DD. Posterior legs about twice as long as the anterior ones.
Megistopoda Macquart
- AA. With a ctenidium Subfamily *Streblinae* Speiser
- B. Wings well developed with six longitudinal veins.
C. Posterior legs about twice as long as the anterior ones.
Strebla Wiedemann
- CC. Posterior legs not twice as long as the anterior ones.
Euctenodes Waterhouse
- BB. Wings reduced *Metelasmus* Coquillett

SUBFAMILY NYCTERIBOSCINAE SPEISER, 1900

Head rounded, without a ctenidium of strong, closely-set, black spines on the under side of the head. Aristas of antennae not compoundly plumose. Last tarsal segment of all the legs usually strikingly broadened, and at least as long as the three preceding together.

Genus *Nycterophila* Ferris, 1916

Genotype, *Nycterophila coxata* Ferris, 1916.

Eyes one-faceted. Thorax strongly compressed, the anterior femora short, expanded dorso-ventrally, and compressed. Wings

(Fig. 16) with a deep apical notch; with only two and a part of a third strong vein near the costal margin and the remainder of the wing with creases. The male genitalia are appressed to the ventral side of the abdomen. Only one species off *Macrotus californicus* in California; off "bats" in the British West Indies; off *Brachyphylla cavernarum* in the British West Indies; off *Chilonycteris rubiginosa rubiginosa* in Panama.

Genus *Trichobius* Gervais, 1844.

Genotype, *Trichobius parasiticus* Gervais, 1844.

Head convex, articulated freely with the thorax. Eyes containing a variable number of heaped facettes. Wings with six longitudinal veins. Hind legs not strikingly elongated.

KEY TO THE SPECIES OF TRICHOBIUS

- A. Size large; over 4 mm.* Median longitudinal suture meets transverse suture.
 - B. Transverse suture marked with a dark line.
 - C. Eight scutellar bristles. Eight facettes in eyes.
 - major* Coquillett
 - CC. Four scutellar bristles. Thirteen facettes in eyes.
 - major*, var. *quartrisetosus* n. var.
 - BB. Transverse suture not marked by a black line.
 - corynorhini* Cockerell
- AA. Less than 4 mm.
 - B. Front margin of thorax straight, causing nearly square anterior angles.
 - C. Thorax shiny and without noticeable bristles in middle of its area (Fig. 6) *parasiticus* Gervais
 - CC. Thorax with largest bristles anteriorly and laterally, but middle area with shorter bristles. Stocky build. Indistinct indentation on wings between 5th and 6th longitudinal veins (Fig. 1) *dugesii* Townsend
 - BB. Front margin of thorax rounded.
 - C. Entire dorsal surface bristled.
 - D. Dorsal surface of thorax with bristles of uniform length. Short median longitudinal suture bifurcated. Slender build (Fig. 8) *cæcus* Edwards
 - DD. Dorsal surface of thorax with long bristles around margins, and shorter ones in the middle. Eyes large and raised, with many facettes. Median longitudinal suture reaches one half of the way to the transverse suture (Fig. 9) *phyllostomæ* n. sp.

CC. Middle of thorax apparently glabrous.

D. With bristles overhanging the scutellum.

E. Cross-vein between 4th and 5th longitudinal veins very near margin of the wing, and inclined outwards at the top (Fig. 10) *sparsus* n. sp.

EE. Cross-veins not as in E. Thorax with two rows containing four bristles on each side of median suture *truncatus* var. A, n. var.

DD. With many short, fine hairs before the scutellum (Fig. 4). Sixth longitudinal vein bowed slightly costad for a part of its length *truncatus* n. sp.

Trichobius major Coquillett, 1899 and Brues, 1904.

Off *Myotis incautus* from Texas; off *Myotis velifer* from Kansas; off bats in Arizona and Florida. Type in the U. S. National Museum.

Trichobius major variety **quadrisetosus** new variety.

This species appears to be so close to *T. major*, that I hesitate to call it a new species, so I am giving it a varietal name, until further study may prove it synonymous, or an entirely different species. Length, 4.91 mm. There are four specimens in the British Museum, bearing only the label: "Presented by Nat. His. Branch of Mexican Geographical Commission, 1911-153."

Trichobius corynorhini Cockerell, 1910.

This species seems also to be very near *T. major* and I am doubtful if it should have more than varietal standing. Female with eleven facettes in eyes and male with fourteen. Middle cross-vein nearer base than apex of wing; the one between the fifth and sixth longitudinal veins conspicuously oblique. Off *Corynorhinus macrotis* from Colorado.

Trichobius parasiticus Gervais, 1914.

This species has been considered synonymous with *T. dugesii*, and consequently the hosts have been confused, and I have therefore omitted the host and locality records from Speiser, 1900. Off *Desmodes* sp. from Brazil and vampires from Peru.

* In determining the length of a specimen, I have measured from the tips of the palpi to the tips of the folded wings, thus avoiding measuring the abdomen, which is likely to be shriveled or distended.

Trichobius dugesii Townsend, 1891.

Off *Glossophaga soricina* from Mexico; off *Chilonycteris rubiginosa rubiginosa* and *Carollia perspicillatum aztecum* from Panama. This species also occurs in Brazil.

Trichobius cæcus Edwards, 1918.

Off *Chilonycteris davyi* from Dominica; off *Chilonycteris rubiginosa rubiginosa*. This species also occurs in Trinidad. Type in the British Museum.

***Trichobius phyllostomae* new species.**

Length of female, 3.42 mm.

Head with a depression along the median line, each side bearing numerous bristles. Palpi oval, with one terminal macrochaeta. Eyes large and raised, containing twenty-four facettes. Basal part of proboscis truncate posteriorly.

Thorax (Fig. 9) somewhat longer than broad, with bristling similar to that of *Trichobius dugesii*, that is, with sparse, moderately long bristles anteriorly and laterally, and much smaller, finer ones in the middle. Mesosternum truncate anteriorly, and produced between the front coxae. Legs normal; femora spiny. Wings typical of the genus; length, 2.55 mm.; breadth at center cross-vein, 1.11 mm.

Abdomen with basal segment only weakly chitinized; as usual, the basal lateral tufts of spines are present, the dorsum bare, sides and ventral surface covered uniformly with short bristles. Apex with two distinct segments ventrally, bearing stronger bristles than the preceding portion. One pair of macrochaetae occur on the ventral side of the unchitinized penultimate segment, and the terminal one bears dorsally at its base, a pair of strong spines, directed laterally; at its middle, four directed posteriorly, while the unchitinized tips bear only soft hairs.

This species differs from *Trichobius major* in being smaller (*T. major* measures 5 mm. from tip of palps to tips of folded wings), in the possession of eyes containing twenty-four, instead of eight facettes, a proboscis truncate instead of rounded posteriorly, the median longitudinal suture of the thorax which reaches only half, instead of all the way, to the transverse suture, and in the bristling of the thorax. In *T. major*, the surface of the thorax is thickly and uniformly covered with bristles of more or less uniform length.

The specimen from which this description is written is a female in the British Museum, off *Phyllostoma*, Humboldt, Brazil, July, 1916, W. Ehrhardt—1921-200.

Trichobius sparsus new species.

Length of female, 3.24 mm.

Head without striking characteristics. Antennae practically concealed in the pits, the aristas projecting beyond. Eyes with eight facettes.

Thorax (Fig. 7) with median longitudinal suture reaching about two-thirds of the way to the transverse suture, the surface appearing shiny and glabrous, except for the few bristles shown. Wings (Fig. 10), noteworthy in that the cross-vein between the fourth and fifth longitudinal veins is very near the wing margin and inclined with it. The cross-vein between the fifth and sixth longitudinal veins is inclined strongly in the opposite direction. The margin of the wings also shows irregularities, which are noticeable. The marginal vein, instead of being rounded near the apex, is cut off, and a slight bulging of the wing appears on the posterior margin. Length of wing 2.42 mm.; breadth at center cross-vein, 1.02 mm. Legs typical of the genus.

Abdomen with basal segment indistinct, not chitinized on the ventral side, but marked as usual by the dorso-lateral tufts of spines. The abdomen of the specimen before me is greatly distended, and has two broad lobes at the apex, with numerous bristles.

T. major has the following characteristics which are different from this species: Larger size, the median longitudinal suture reaches all the way to the transverse suture and the entire thorax is uniformly covered with shorter bristles. The outer cross-veins of the wings are approximately perpendicular to the longitudinal veins.

The specimen from which this description is made is a female off *Chilonycteris rubiginosa rubiginosa*, from Chilibrillo River, Panama, September 2, 1923, bearing the names J. Zetek, I. Molino and R. C. Shannon as collectors. Type in the U. S. National Museum.

Trichobius truncatus new species.

Length of type (male), 2.50 mm.; of allotype 2.78 mm.

Sides and ventral surface of head, except for the proboscis, densely bristled, the latter shiny and smooth with two long hairs on the globular part at the base of the terminal rodlike portion. Palpi each bear three

strong spines, the interior one the smallest; at the antero-lateral corners is a distinct notch. The eyes contain eight facettes. Between the eyes is a mass of bristles, which criss-cross each other. Back of these, there are no more bristles in the median area or on each side for a narrow transverse strip. But behind this, on each side are seven bristles of various sizes, not forming a border to the head.

• Thorax (Fig. 4) rounded anteriorly, with a shallow, median indentation. Median longitudinal suture reaching two-thirds, or a little more, of the way to the transverse suture. On the notum on each side of the longitudinal suture, near the front margin, are two irregular rows of three bristles; a few other bristles occur along the edge of the notum and the usual four on the scutellum; numerous very fine hairs appear in front of the scutellum and along the transverse suture. Except for these bristles, the entire dorsal surface is shiny and glabrous. Meso- and metasternum shaped as in Fig. 5. Legs slender, except for the front femora, which are considerably thickened. The front femora also bear the strongest bristles of the legs. Wings typical of the genus; length of wing of allotype 2.22 mm.; breadth at center cross-vein .9 mm.; about half of the way to the cross-vein between the fifth and sixth longitudinal veins, the sixth is bowed slightly toward the costal margin, instead of following the even curve of the hind margin.

Abdomen of female chitinized at the base, covered uniformly with short bristles on the ventral and lateral surfaces; dorsum free from bristles; a mass of bristles at each antero-lateral angle; with prominent terminal tubercle, bearing four bristles distinctly longer than the rest; two elliptical elevations more ventrad, each bearing numerous bristles, and one particularly long one.

Abdomen of the male similar to that of the female, except for the presence of a terminal segment, which turns ventrad, and usually has a falciform process of the genitalia protruding from it.

Types with numerous paratypes in the British Museum, bearing the label: "Dominica, July, 1901. H. S. B. 1908-230." It is also recorded from Bat's Cave, near English Harbor, St. John's, Antigua, British West Indies.

Trichobius truncatus var. **A**, new variety.

The specimens in this group are very similar to those of *T. truncatus*, and it does not seem worth while to give them a name. The most noticeable differences occur in the bristling of the thorax, there being two quite regular rows of four bristles on either side of the median suture, and a row of bristles overhanging the scutellum. The middle area is covered with fine bristles which are difficult to see. The vial containing the specimens is in the British Museum. They are off *Vespertilio nigricans*, from Basin Well, Dominica (1903-89).

Genus *Pseudostrebla* Costa Lima, 1921.Genotype, *Pseudostrebla ribeiroi* Costa Lima, 1921.

Head flattened, much wider than long, and with large lateral lobes, which are drawn out into short processes at their inner margins. Palpi triangular, the bases approximating each other, and the apices directed laterally. Thorax rectangular. Wings with six longitudinal veins. Legs not greatly elongated. Only one species off *Tonatia amblyotes* from Brazil.

Genus *Paratrichobius* Costa Lima, 1921.Genotype, *Paratrichobius longricrus* Ribeiro, 1907.

Well-developed compound eyes. Thorax narrowed anteriorly, the mesosternum extending far between the front coxae, and covering their bases. Anterior legs with a very striking diagonal row of thick, strong, black spines; posterior legs greatly elongated, the femur and tibiae being bowed; tarsi not strikingly broadened. Wings well developed, with six longitudinal veins. Only one species off *Artibius jamaciensis*, and "leaf-nosed bat" from Brazil.

Genus *Synthesiostrebla* Townsend, 1913.Genotype, *Synthesiostrebla amorphochili* Townsend, 1913.

Thorax much broader than long. Wings well developed with six longitudinal veins. Posterior legs nearly three times as long as the anterior ones. Front edge of the thorax with a pair of strong teeth on the median line, directed anteriorly, and fitting into corresponding grooves in the back of the head. Only one species off *Amorphochilus schnablii* from Peru.

Genus *Speiseria* new genusGenotype, *Speiseria ambigua* new species.

In spite of the length of the hind legs, I am not placing this specimen in the Genus *Paratrichobius*, because of the absence of a diagonal row of strong spines on the front femora, and on account of the shape of the thorax, which is not longer than broad, or in *Synthesiostrebla*, because of the difference in venation, and the lack of any such modification on the anterior margin of the thorax as described by Townsend (1913) for this

genus. The thoracic and venational characters are similar to those of *Trichobius*, but the long hind legs evidently bar it from this genus. The femuro-tibial joint of the hind legs reaches as far as the point where the first longitudinal vein joins the margin of the wing. Wings well developed, with six longitudinal veins. The middle legs are also somewhat elongated, and reach about to the tip of the wings.

Head with postero-lateral parts somewhat produced and fitting into corresponding depressions of the thorax. Beginning laterad of the eyes, and especially including the labrum, the head appears to be shelved out, as contrasted with the part back of it, which is highly convex. Each of the first four segments of the tarsi shorter than the preceding one, but the last is as long as the three preceding together.

Speiseria ambigua new species.

Length, 3.43 mm.

Head bearing numerous long bristles; palpi apparently turned outward, so that the largest bristle on each takes a lateral position; eyes difficult to make out, but apparently with five facets; antennae not prominent.

Thorax with antero-lateral depressions to receive the lateral lobes of the head (Fig. 3); anterior margin with a median indentation. Dorsal median longitudinal suture reaching to the transverse suture; covered with bristles of irregular size, much weaker and sparser in the center; with a row of strong bristles in front of the scutellum, the latter bearing the usual four long bristles, the inside two inserted distinctly posterior to the outer ones. Meso- and metasternum shaped as in Fig. 2, and projecting anteriorly between the front coxae, which are narrow and upstanding between the head and thorax, somewhat as in *Paratrachobius*, and with several strong bristles. Hind coxae with strong, short bristles on the inner margin; corresponding trochanters also with a few similar bristles. Femora and tibiae uniformly bristled, with fewer larger bristles interspersed. Length of wing, 1.85 mm.; breadth at cross-vein, 1.46 mm.

Abdomen without diagnostic characteristics so far as I am able to tell.

The specimen from which this description is written is a female, and it bears a label which is so faded that I can make out only parts of it, and those somewhat uncertainly. It follows: "Vampyrus . . . Pernambuco (Forbes)." Its designation at the British Museum is 1911-103. This species also occurs on *Carollia perspicillatum aztecum* in Porto Bello, Panama.

Genus *Nycteribosca* Speiser, 1900.

(= *Raymondia* Frauenfeld, 1855; *Strebla* Kolenati, 1856; *Brachytarsina* Kolenati, 1862).

Genotype, *Nycteribosca amboinensis* Rondani, 1878.

Both head and thorax rounded and highly convex, the head freely articulated with the thorax. Eyes one-faceted. Pro-

boscis with a large basal portion, and very short terminal tubular part. Wings with anal lobe. Anterior coxæ near together, and a curiously branched empodium is visible between the claws of all the tarsi (Fig. 25). Broadly speaking the locality is the Mediterranean regions.

KEY TO THE SPECIES OF NYCTERIBOSCA

- A. Head black, with pale eyes and median longitudinal stripe.
gigantea Speiser
- AA. Head uniform in color.
 - B. Second longitudinal vein forked near the tip.....*diversa* Frauenfeld
 - BB. Second longitudinal vein not forked at the tip.
 - C. Wings twice as long as the body.....*africana* Walker
 - CC. Wings not twice as long as the body.
 - D. Thorax about as broad as long.*
 - E. Scutellum with posterior tip pointed, of a dark color, and bent ventrad.....*rouxi* Falcoz
 - EE. Scutellum not as described in E.
 - F. Third and fourth longitudinal veins divergent (Fig. 12).....*kollari* Frauenfeld
 - FF. Third and fourth longitudinal veins parallel (Fig. 14).....*alluaudi* Falcoz
 - DD. Thorax longer than broad.....*amboinensis* Rondani
?surcoufi Falcoz

The foregoing key, made out mostly from authors' descriptions, shows that the Genus *Nycteribosca* contains some well-defined species. However, I have before me eleven vials, containing specimens from various localities and hosts, which seem to be somewhat like each other, and yet differing in characters that would presumably be specific, if they were constant, but which show gradations. Very slight gradations also appear in specimens taken from the same host in the same locality at the same time, which would seem to indicate that there is a species apparently near *kollari*, which is in an unstable condition. Accordingly, I have not attempted to name the specimens, which I have been studying, but have designated them with numbers, and shall undertake a discussion of the characters.

* The scutellum is included in the length, and the breadth is taken at the transverse suture within the pleural sutures.

Although small differences occur in the shape and bristling of the thorax, the venation provides characters which are more definable. Perhaps the most noticeable character is the relation of the tips of the third and fourth longitudinal veins to each other. Numbers 1, 2, 3, 6, 7 have these veins widely divergent; in 4, 5, 10 and 11 they are only slightly divergent; in 8 and 9 the veins are parallel. In this genus there is an anal cell at the base of the wing, and the posterior vein of this cell may carry a distinct spur at right angles to the vein as in numbers 2, 3, and 7; others have a marked thickening on the vein, which appears to vary somewhat in form, as in numbers 5, 6, 8, 10 and 11, or even this may be lacking as in numbers 1, 4 and 9. A number of authors have used the character: fifth longitudinal vein nearly reaching the margin of the wing, or not nearly reaching the margin, (Figs. 12 and 14). The latter condition appears only in 2, 3 and in *N. alluaudi*.

Following is a list of the material that I have been studying: 1. Off *Miniopterus fuliginosus* from Uva, Ceylon, in the Cambridge Museum; 2. off *Rhinolophus blasii* from Jerusalem, in the Cambridge Museum; 3. off same host from Jenin, Palestine, in the Cambridge Museum; 4. off *Miniopterus schreibersii* from Peradeniya, Ceylon, in the Cambridge Museum; 5. off same host from Maha Illupalama, Ceylon, in the Cambridge Museum; 6. Host unknown, from British Somaliland, in the British Museum; 7. off *Rhinolophus euryale* from Hammam Meskoutine, East Algeria, in the Cambridge Museum; 8. off *Hipposideros speoris speoris* from Trincomalee, Ceylon, in the Cambridge Museum; 9. off *Hipposideros lankadiva* from Peradeniya, Ceylon, in the Cambridge Museum; 10. off *Rhinolophus rouxi* or *Hipposideros speoris* from Alutnwara, Ceylon, in the Cambridge Museum; 11. off *Miniopterus* sp. from Helwak, India, in the British Museum.

Nycteribosca gigantea Speiser, 1900.

Large species, at least 4.0 mm. General color, reddish brown, except for the head which is nearly black, with a pale median dorsal strip, which makes a loop on the vertex of the head. Eyes

conspicuous on account of their light color. Meso-metasternal suture practically obliterated. Off *Cephalotes peronii* from Bismarck Archipelago; off bats from the Philippine Islands and Borneo.

Nycteribosca diversa Frauenfeld, 1856.

The branching of the second longitudinal vein is unique and this is the only record for the whole family, and since it has not been recorded since the description was written, it may be a freak. One of the specimens in vial No. 7 has a supernumary cross-vein, which shows that such irregularities may occur. Off *Cynonyctaris ægyptiaca* from Egypt.

? *Nycteribosca africana* Walker, 1849.

Placed provisionally in the genus by Speiser in 1900, as he could not see the type and the description is inconclusive. From the Cape. I was unable to find the type of this species in the British Museum.

Nycteribosca rouxi Falcoz, 1923.

Off *Notopteris neocaledonica* from New Caledonia.

Nycteribosca kollari Frauenfeld, 1855.

Bristles of thorax erect.

The characters for the key have been taken from Falcoz, 1923a. He records this species from Algeria off *Rhinolophus hipposideros*, *R. mehelyi*, and *Miniopterus schreibersii*. Speiser (1900) records it from the following hosts: *Phyllorhina tridens*, *Rhinopoma microphyllum*, *Vespertilio murinus*, and *Rhinolophus euryale* from Cairo, Tunis and Sardinia.

Nycteribosca alluaudi Falcoz, 1923a.

Thorax with short recumbent bristles. Second longitudinal vein turned abruptly toward costal margin. Off *Taphozous mildegardeae* in British East Africa; off *T. melandpogon* from Mandalay, Burma.

Nycteribosca amboinensis Rondani, 1878.

Off *Miniopterus schreibersii* and *Myotis adversus* in Amboina; off *Miniopterus schreibersii* in Queensland; off *Hipposideros larvatus* from Selangor; off bats from Nicobar Island.

Nycteribosca surcoufi Falcoz, 1923b.

I have not seen a specimen of this species, but it seems to be very near, if not identical with *N. amboinensis*. Specimens of the latter from Amboina, determined by Dr. Speiser, appear to agree with Falcoz's description, possessing the characters which Falcoz proposes to use to differentiate *N. surcoufi*. Off undetermined hosts from New Caledonia and Loyalty Islands.

Genus *Raymondia* Frauenfeld, 1855.

(= *Strebla* Kolenati, 1856).

Genotype, *Raymondia huberi* Frauenfeld, 1855.

Head closely articulated with the thorax, somewhat flattened, as also is the thorax. Palpi small. Eyes lacking. Front coxae widely separated. Wings short and broad with five longitudinal veins.

KEY TO THE SPECIES OF RAYMONDIA

A. With anal lobe on wings (Fig. 18).....*lobulata* Speiser
AA. Without an anal lobe.

B. Fourth vein of wings (Fig. 17) bent abruptly downward after branching, causing considerable enlargement of the cell anterior to it.....*pagodarum* Speiser

BB. Fourth vein nearly straight (Fig. 17).....*huberi* Frauenfeld

Raymondia lobulata Speiser, 1900a.

In addition to the anal lobe of the wing, this species is readily distinguished by a row of bristles along either side of the median sternal suture. Bulbous part of the proboscis as wide as the anterior margin of the mesosternum. Scutellum with only two bristles. Off *Megaderma lyra* from Ceylon, from bats in Madras and British Somaliland.

Raymondia pagodarum Speiser, 1900.

Dorsal transverse suture of the thorax visible for its entire length. Off *Hipposideros speoris speoris* from Ceylon; off *H.*

larvatus (or *Rhinolophus malayanus*) from the Malay Peninsula; off *Emballonura nigrescens* from Molucca Islands and Amboina; off ? *Rhinolophus affinis* from Ceylon.

Raymondia huberi Frauenfeld, 1855.

Dorsal transverse suture of the thorax obliterated except toward the sides of the thorax. Off "bat" from British East Africa; off "a small broad-eared bat" from Aden; off ? *Hipposideros caffer* from Zululand; off "horseshoe-nosed bat" from Luxor, Egypt; off *Phyllorhina tridens* and *Megaderma cor*; other records from Egypt and Abyssinia.

Genus *Brachytarsina* Macquart, 1853.

Genotype, *Brachytarsina flavipennis*, Macquart, 1853.

Wings with only four longitudinal veins. Algeria. Speiser, 1908, suggests that this species may be identical with *Nycteribosca kollari*.

Genus *Pterellipsis* Coquillett, 1899.

Genotype, *Pterellipsis aranea* Coquillett, 1899.

(= *desiderata* Speiser, 1900).

Wings, four times as long as broad, projecting obliquely upwards and backwards (Fig. 15). Venation distinct. Posterior legs greatly elongated, nearly twice as long as the middle ones. Only one species collected in the West Indies, Porto Rico and Cuba from unrecorded hosts. Type in the U. S. National Museum.

Genus *Aspidoptera* Coquillett, 1899.

(= *Lepopteryx* Speiser, 1900).

Genotype, *Aspidoptera busckii* Coquillett, 1899.

Wings reduced to oblong, coriaceous organs, bearing bristles. They are appressed to the body and do not reach beyond the first fourth of the length of the abdomen; less than twice as long as broad. Legs short; femora enlarged.

KEY TO THE SPECIES OF ASPIDOPTERA

(Modified from Costa Lima, 1921.)

- A. Tips of vestigial wings, truncate.
 - B. Six distinct longitudinal veins. Mesonotal suture forming an inverted "T."
 - C. Tibiae with long bristly hairs.....*phyllostomatis* Perty
 - CC. Tibiae only pubescent.....*busckii* Coquillett
 - BB. Veins indistinct (Fig. 13). No transverse suture on the mesonotum*minuta* Costa Lima
- AA. Tips of vestigial wings acute (Fig. 11). Mesonotal suture forming an inverted "Y".....*megastigma* Speiser

Aspidoptera phyllostomatis Perty, 1830.

Last tarsal segment not so broad as long. Off *Phyllostoma* sp. in Brazil; off *Sturnira lilium* in Paraguay; off *Glossnycteris geoffroye* in Trinidad. ?

Aspidoptera busckii Coquillett, 1899.

Speiser 1900b states that this is synonymous with *A. phyllostomatis*, but Coquillett says: "It is readily distinguished by the fact that the tibiae are only pubescent, while in *A. phyllostomatis*, four Brazilian specimens of which are before me, the tibiae are fringed with comparatively long bristly hairs." Off *Artibus*, sp. in Porto Rico. Type in the U. S. National Museum.

Aspidoptera minuta Costa Lima, 1921.

Venation practically obliterated. Female with genital segment bearing three setiferous lobes, of which the median one bears four bristles, and the laterals, eight. Off "bats" at Panama, and off *Tonatia amblyotes* in Brazil.

Aspidoptera megastigma Speiser, 1900.

Eyes lacking. Scutellum small. Mesothoracic spiracles large and striking. Venation indistinct. Off *Noctilio leporinus* of unknown locality. This bat is known to occur in Colombia.

Genus *Paradyschiria* Speiser, 1900.Genotype *Paradyschiria dubia* Rudow, 1871.

Eyes one-faceted. Pleural sutures of the thorax moved dorsad, forming with the longitudinal suture, two oblong areas. A

pair of spiracles have also moved dorsad, and appear at the dorso-lateral corners of the above described oblong areas.

KEY TO THE SPECIES OF PARADYSCHIRIA

- A. Meso-metasternal suture with a bend. Claws bearing a small tooth.
dubia Rudow
AA. Meso-metasternal suture straight. Claws do not bear a small tooth.
lineata n. sp.

Paradyschiria dubia Rudow, 1871.

Ventral surface of the apex of the abdomen with a small wart-like elevation. Off *Noctilio leporinus* from Colombia.

Paradyschiria lineata, new species.

The specimen from which this description is made is a female, and was caught in Cuba, by Dr. W. H. Hoffman, and is in the author's collection. The host is unfortunately not given. Several paratypes are in the collection at the Cambridge Museum.

Length of body, 1.67 mm. measured, in this case, from the tips of the palps to the end of the abdomen.

Head round and highly convex, with a pair of large, one-faceted eyes. Palpi broadly rounded, with a long, strong bristle at the tips. On either side of these are bristles about one-third as long, the inner one crossing the corresponding bristle on the other palpus. On the under side of each palpus, near the anterior margin is one strong, downwardly directed bristle. The labium is slightly indented on the median line. From the margin of the indentation containing the proboscis, four rather large bristles extend posteriorly. Slightly below and in front of the eye is a forwardly directed bristle of moderate size. There are two oblong chitinous areas between the eyes, each beset with a macrochaeta and two smaller bristles. In a posterolateral position from each of these areas is the beginning of another chitinous part, which continues around the side of the head, apparently as the gena. This bears dorsally two macrochaetae, and two smaller bristles. Other minor bristles are present. Between the chitinous areas described, is an unchitinized space without vestiture about as large in extent as the two areas between the eyes.

Thorax. The dorsal longitudinal suture is visible for about two-thirds of the length of the dorsal oblong chitinous plates. These plates each bear a large macrochaeta near the posterior margin, a much smaller bristle further forward, while between them is one still smaller. Near the anterior margin of the thorax and beside the above mentioned oblong areas, the large spiracles stand out conspicuously, the diameter being about equal to the width of one of these areas. A more or less triangular sclerite, laterad of

the spiracle and oblong area, bears a medium sized bristle near its posterior margin, a smaller one just behind the spiracle, and one other still smaller placed somewhat laterad. The scutellum bears two macrochaetae, and the suture of the scutellum runs out to a lateral sclerite bearing two medium sized bristles. Ventrally the thorax appears normal, and the suture between the meso- and metasternum runs straight to the margin behind the middle coxæ. This aspect of the thorax is sparsely bristled with short erect bristles. Dorsally the front coxæ bear one short, strong, erect bristle, while underneath there are two noticeable bristles which bridge the space between the coxa and the anterior edge of the trochanter. Legs beset with short, stubby, erect bristles, arranged in longitudinal rows. Last segment of each tarsus abruptly depressed from its highest point to the attachment of the claws, with a crown of bristles around the depressed area. Claws simple. Pulvillæ well developed.

Abdomen. Dorsal posterior margin of the basal segment provided with strong bristles, the pair nearest the median indentation of only medium size; laterad of these, are two pairs of macrochaetæ, as well as some smaller bristles. There are few other bristles on the dorsal side of this segment, but ventrally they are quite numerous. On either side, just posterior to this segment, occurs an irregularly shaped dark marking. Dorsally, the remainder of the abdomen, except for the tip, is beset with transverse rows of bristles, which are weaker toward the median line, while underneath, the bristles are mostly weak, scattered, and sparse. At the tip of the abdomen is a dorsal more or less circular chitinous elevation with six macrochaetæ on its margin. Ventrally, near the tip, is a pair of strongly bristled, circular, chitinous areas, which are slightly elevated.

This species differs from *dubia* in the following characters, as far as I have been able to make them out from Dr. Speiser's description. In *P. dubia*, the suture between the meso- and metasternum leaves the ventral longitudinal suture at right angles, but bends abruptly, and reaches the margin of the thorax behind the middle coxæ, while in this species it is straight. Reference is made to a ventral wartlike elevation, while this species bears two ventrally and one dorsally. The claws do not bear, in the bend, a small tooth, as described by Dr. Speiser for *P. dubia*.

Genus Megistopoda Macquart, 1852.

Genotype, *Megistopoda pilatei* Macquart, 1852.

Wingless. Posterior legs greatly elongated. Off red bat in Mexico.

Strebla molossus Giglioli, 1864.

This species is problematical, though probably distinct, since it is the only record of a *Streblid* from China. Speiser 1900 placed it in the Genus *Trichobius*, and suggests that the host is probably *Nyctinomus cestoni* as that is the only Molossid in China. It seems unlikely that a member of a South American genus should occur in China, and Speiser 1908, without stating his reasons, transferred this species to the Genus *Raymondia*, but this does not help matters, because Giglioli refers to characters in his description which do not occur in the known members of this genus. I am unable to say where it belongs, since I have not seen a specimen, but I am confident that it is not a *Strebla*.

Subfamily *Streblinae* Speiser, 1900.

Head flattened, the palpi appearing as the front part of the head. Aristas, at least in *Euctenodes* and *Strebla*, compoundly plumose. A ctenidium of strong spines, similar to those on the head of a flea, occur on the ventral side of the head. Last tarsal segment only slightly thickened. Thorax distinctly longer than broad, with a groove at the sides for the reception of the anterior legs when at rest.

Genus *Strebla* Wiedemann, 1824.

Genotype, *Strebla vespertilionis* Fabricius, 1805.

Slender form (Fig. 20) as compared with *Euctenodes* (Fig. 21). Posterior legs strongly elongated.

KEY TO THE SPECIES OF STREBLA

A. Last three longitudinal veins not reaching the wing margin.

vespertilionis Fabricius

AA. Last three longitudinal veins reaching the wing margin.

avium Macquart

Strebla vespertilionis Fabricius, 1805.

Eyes with seven facettes. Antennae nearly contiguous. Fish-finlike spine, seen on edge, directed laterally, immediately behind the ctenidium (Fig. 24). Off *Vampyrops lineatus* and *Lonchoglossa caudifera*.

Localities: Colombia, Brazil, Jamaica and Mexico.

Strebla avium Macquart, 1854.

Hosts: doves and parrots.

Localities: San Domingo and Cuba.

Genus *Euctenodes* Waterhouse, 1879.

Genotype, *Euctenodes mirabilis* Waterhouse, 1879.

This genus differs from *Strebla* principally in the shortness of the posterior legs, and in the stoutness of the body (Figs. 20 and 21). Frequently confused with *Strebla*, because Waterhouse failed to show the transverse veins of the wings in his figure. This has resulted in all specimens with crossveins being placed in *Strebla*. Type in British Museum.

KEY TO THE SPECIES OF EUCTENODES

- A. Anterior transverse suture of the thorax showing very faintly (Fig. 21). No long bristle on the wing margin at the tip of the third longitudinal vein.....*mirabilis* Waterhouse
AA. No trace of an anterior transverse suture on the thorax. One long bristle on wing margin at the tip of the third longitudinal vein.
tonatiae Kessel

More minute differences may be ascertained by a comparison of Figs. 22 and 24.

Euctenodes mirabilis Waterhouse, 1879.

Length of body, 2.75 mm.

Off *Hemiderma perspicillatum* from Pernambuco; off *Phyllostoma hastatus* from Peru; off an opossum *Glironia venusta* from Bolivia; off Vampires from San Lorenzo Islands; off *Desmodus* sp. from San Lorenzo Islands off Callao, Peru; off *Phyllostoma* sp. from Humboldt; off *Carollia perspicillatum aztecum* from Panama; off "leaf-nosed, short-tailed bat" from Paraiso, Canal Zone.

Euctenodes tonatiae Kessel, 1924.

Length of body, 2.24 mm. Angle between antennae wide; the processes of the aristas about equally distributed on each side. Wings short, broad, and rounded. Bristles on sides of abdomen

closely appressed. Off *Tonatia brasiliensis* from Ecuador. Type in British Museum.

Genus *Metelasmus* Coquillett, 1907.

Genotype, *Metelasmus pseudopterus* Coquillett, 1907.

According to the original description, there are no eyes or antennae. Hind legs not elongated. Wings reduced to oval pads, less than half as long as the thorax. Only one species off *Artibius literatus* from Paraguay. Type in the U. S. National Museum.

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EXPLANATION OF PLATES I TO IV

PLATE I.

1. *Trichobius dugesii* Townsend. Dorsum of Thorax.
2. *Speiseria*, n. gen. Meso- and metasternum.
3. *Speiseria*, n. gen. Dorsum of thorax.
4. *Trichobius truncatus* n. sp. Dorsum of thorax.
5. *Trichobius truncatus*. Meso- and metasternum.
6. *Trichobius parasiticus* Gerv. Dorsum of thorax.
7. *Trichobius sparsus* n. sp. Dorsum of thorax.
8. *Trichobius caecus* Edwards. Dorsum of thorax.
9. *Trichobius phyllostomae* n. sp. Dorsum of thorax.

PLATE II.

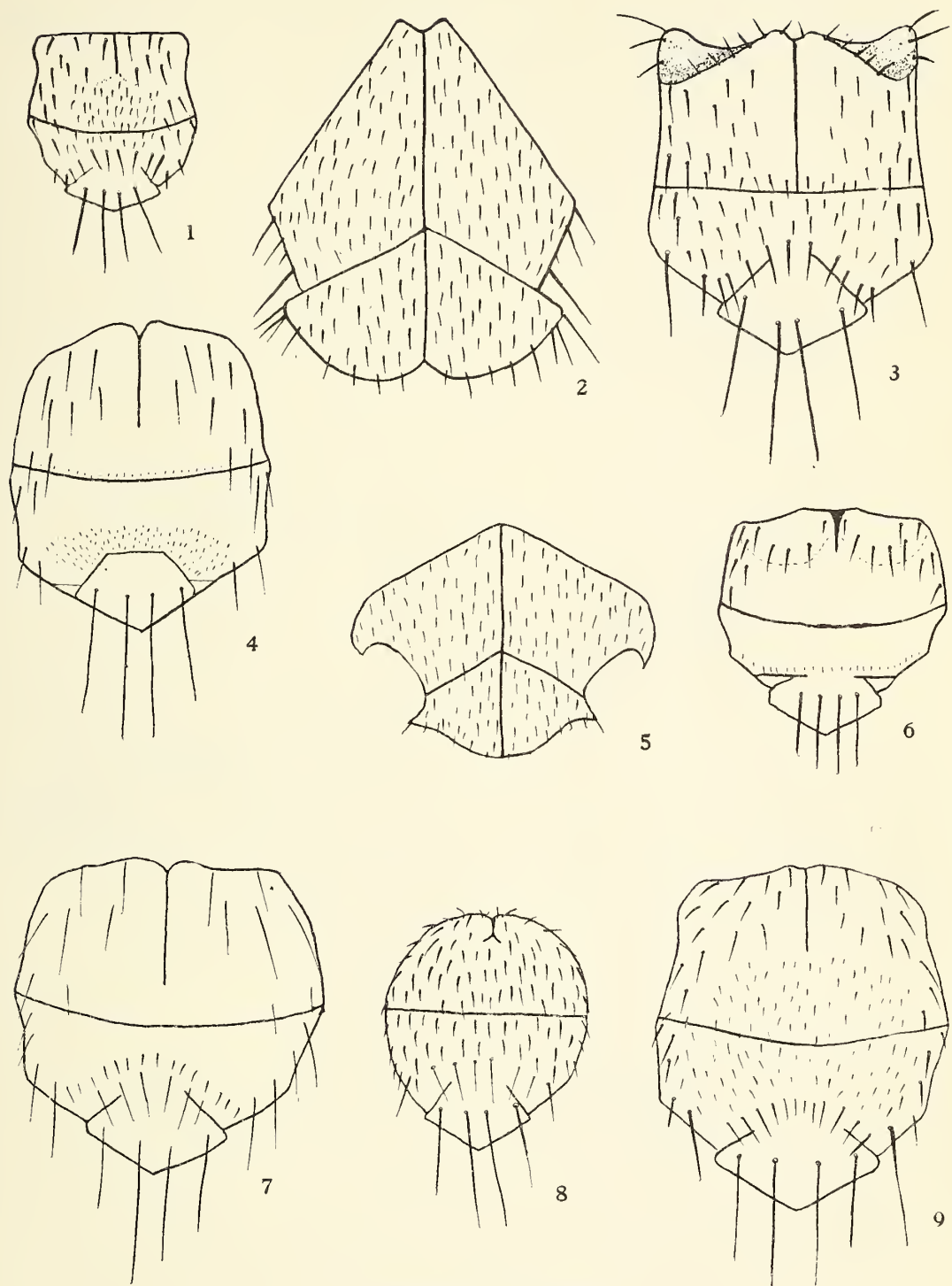
10. *Trichobius sparsus* n. sp.
11. *Aspidoptera megastigma* Speiser.
12. *Nycteribosca kollari* Frauenfeld.
13. *Aspidoptera minuta* Costa Lima.
14. *Nycteribosca alluaudi* Falcoz.
15. *Pterellipsis aranea* Coquillett.
16. *Nycterophila coxata* Ferris.
17. *Raymondia pagodarum* Speiser.
18. *Raymondia lobulata* Speiser.
19. *Raymondia huberi* Frauenfeld.

PLATE III.

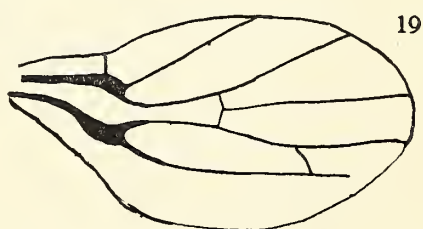
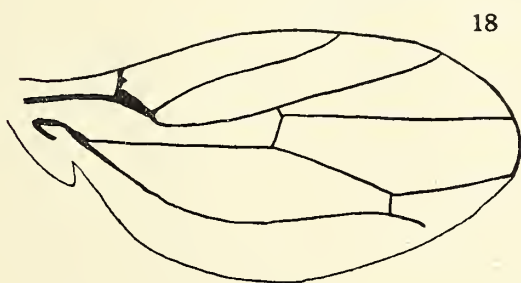
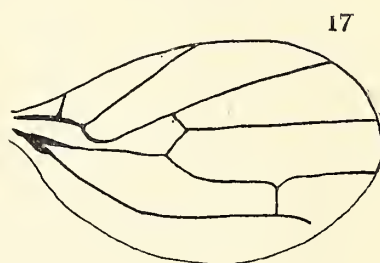
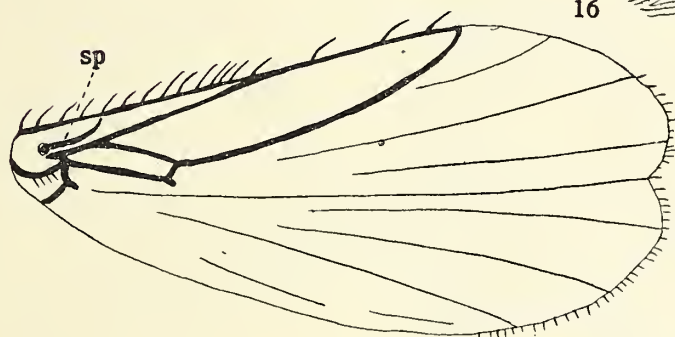
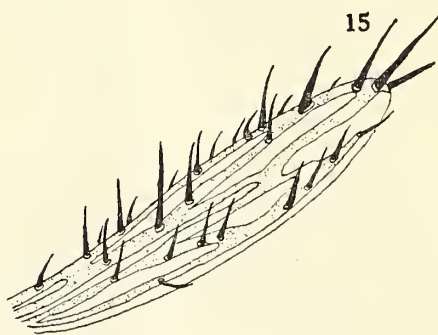
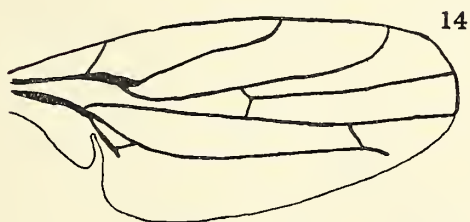
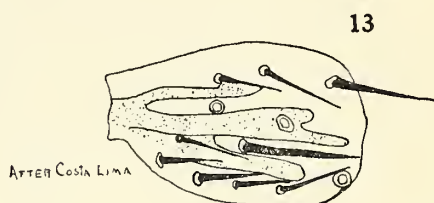
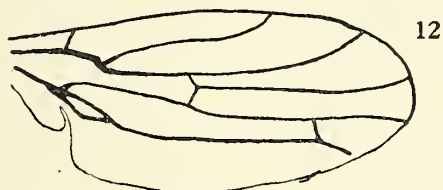
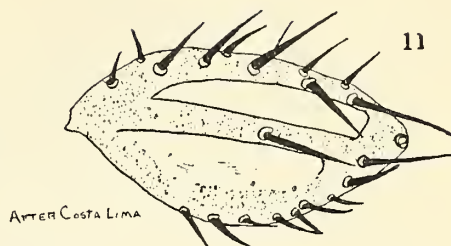
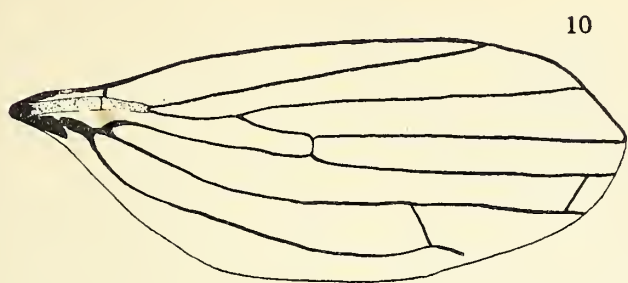
20. *Strebla vespertilionis* Fabricius.
21. *Euctenodes mirabilis* Waterhouse.

PLATE IV.

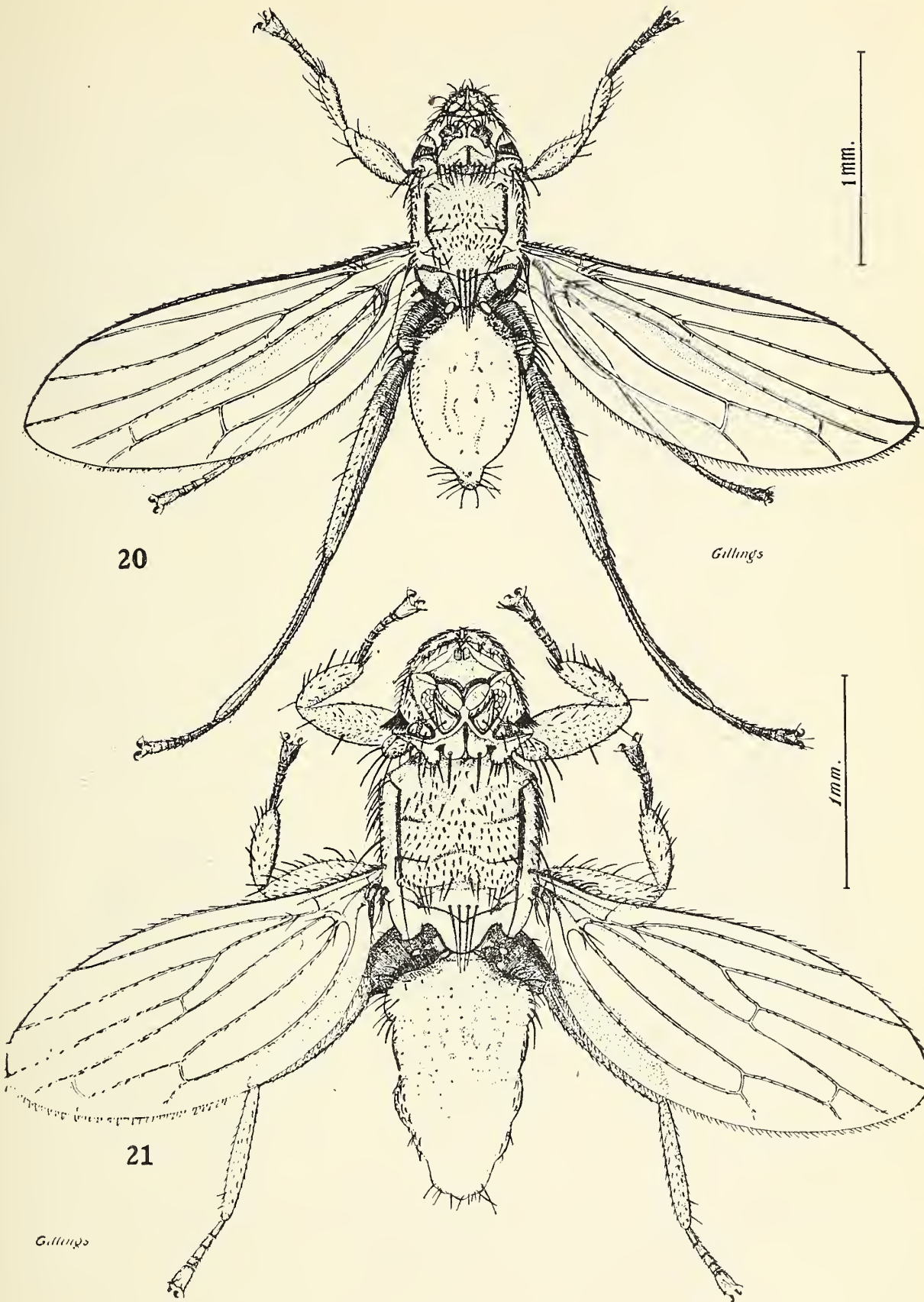
22. *Euctenodes mirabilis* Waterhouse. Head.
23. *Euctenodes mirabilis*. Antenna.
24. *Strebla vespertilionis* Fabricius. Head.
25. *Nycteribosca amboinensis* Rondani. Tarsus, showing branched empodium.
26. *Euctenodes tonatiae* Kessel.



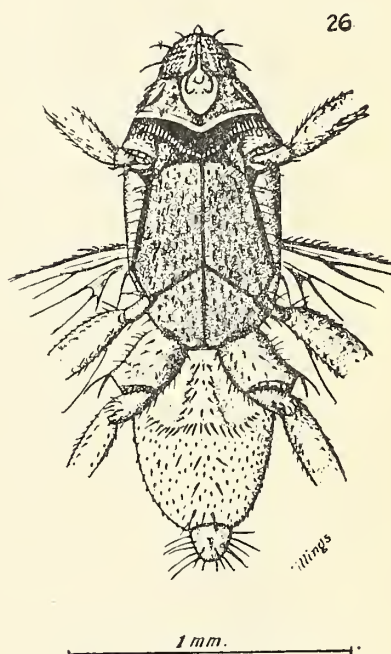
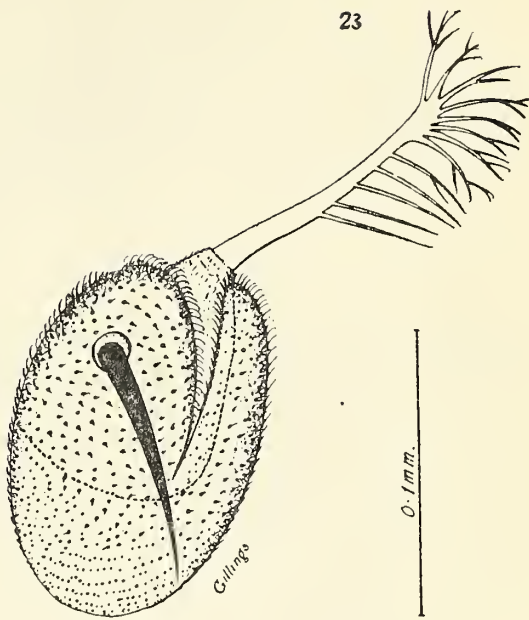
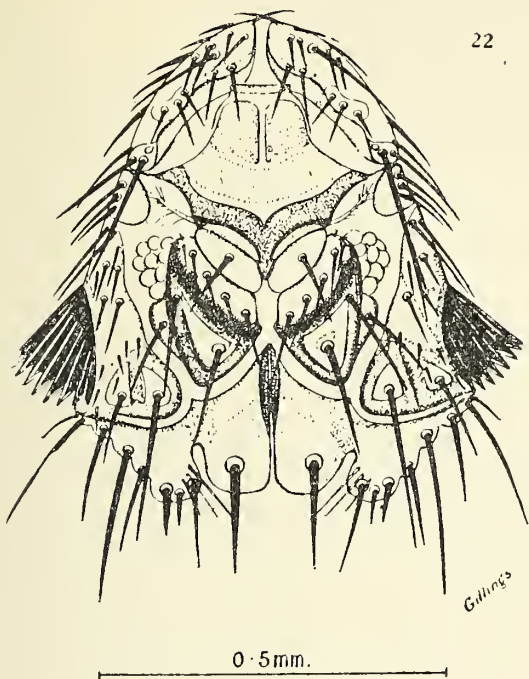
STREBLIDAE.



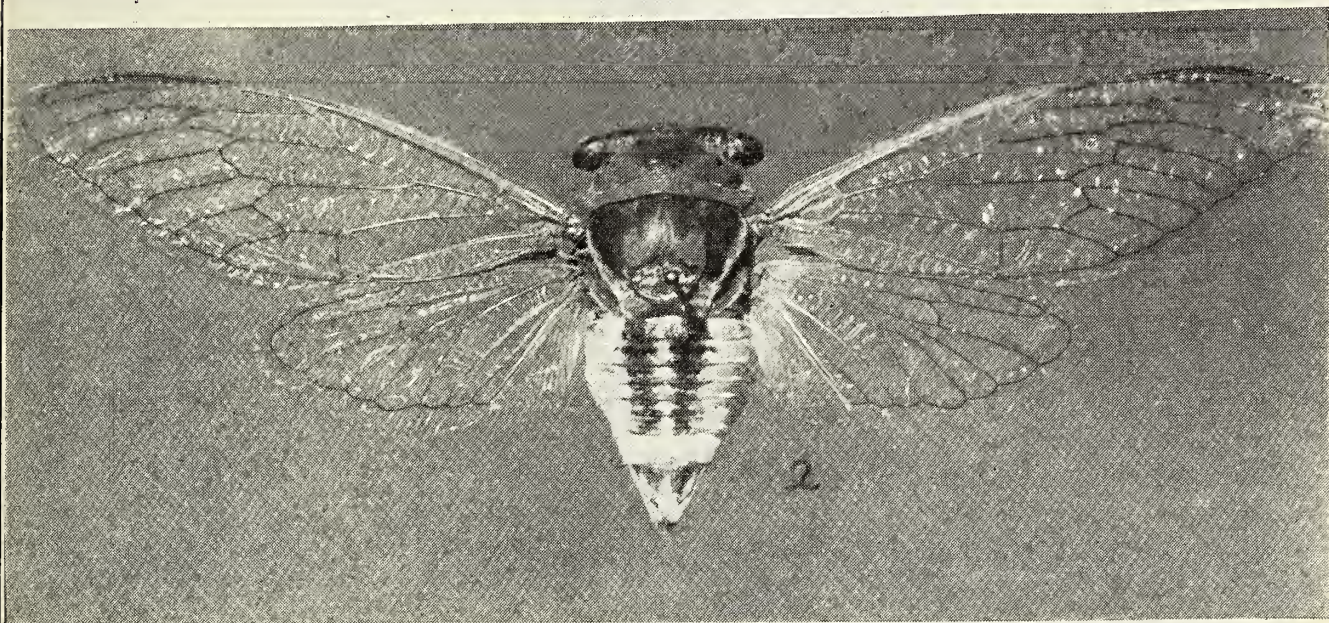
STREBLIDAE.



STREBLIDAE.



STREBLIDAE.



CICADIDAE.

**CICADA TIBICEN, A SOUTH AMERICAN SPECIES,
WITH RECORDS AND DESCRIPTIONS OF
NORTH AMERICAN CICADAS.**

BY WM. T. DAVIS

STATEN ISLAND, N. Y.

Cicada tibicen Linn. (Pl. V, fig. 1.)

Owing to the continued and erroneous use of this name for a North American Cicada the following facts are presented: In 1705 Maria Sibylla Merian published a work on the insects of Surinam, South America, and on plate 49 showed a cicada in the act of flying and a cicada nymph sucking a flower. The figure of the cicada has been reproduced on the plate accompanying this article from the 1719 edition of the work in the library of the American Museum of Natural History. The figure on the original plate shows an insect with the margin of all of the wings slightly yellowish or brownish yellow in color. The explanation of plate 49 is in Dutch, but the copy in the museum library has interleaved pages which bear English translations, and that referring to the cicada is as follows: "The Pomegranate which is a Tree sufficiently known all over, y^e World, grows in y^e Fields at Surinam, I observed on it a kind of Beetle, which was naturally very slow and sluggish and consequently easy to be taken; under y^e forepart of their Head, they have an oblong Probocis, which they stick into Flowers, when they suck out y^e Honey; On y^e 29th it remained without Motion, and y^e skin on y^e Back breaking of its own accord, produced green Flies with Transparent Wings, they are very common at Surinam, and Fly with Extraordinary swiftness, that it took me up several hours to Catch one of them, This Fly makes a Sound like a Lute, and may be heard a great way off by its Singing for which reason y^e Dutch call it Lierman or the Harper, it has y^e same Probosis as y^e Beetle had, and when y^e Feet Eyes and Body were come through y^e Back y^e cast skin retains y^e form of y^e first Insect."

In 1758 *Cicada tibicen* was described by Linné in *Systema Naturæ*, ed. X, p. 436. The description is not sufficiently in detail to identify the species, but Merian's figure on plate 49 already referred to is cited, and "Habitat in America" is added for locality.

In 1764 *Cicada tibicen* is more amply described by Linné in *Museum Ludovicæ Ulricæ Reginae* p. 160, where he refers to Merian Surinam, pl. 49, and to Brown's Jamaica 436, pl. 43, fig. 15. He gives habitat as Surinam and Carolina.

So it was Linné himself who was responsible for the statement that *tibicen* also occurred in North America, as pointed out to me by Mr. W. E. China, of the British Museum, and not Stål as suggested by Smith and Grossbeck in *Entomological News*, April, 1907.

We may here state that no cicada is known to inhabit both Carolina and South America. The species that comes nearest to doing so is *Quesada gigas* Oliv., which does not get further north than Southern Texas.

In 1892, P. R. Uhler, in the Transactions Maryland Academy of Sciences, states: "The description of Linnaeus, Mus. Lud. Ulricæ, p. 160, embraces the characters of two or three species, one of which appears to be the *Cicada* [*Tettigonia*] *mannifera* Fab., but the figures of Merian, Brown and Seba cited in the same place, represent species very different from the true *C. tibicen*. More recently Dr. Stål has examined a type of our insect in the collection of Fabricius, and from him I have received a positive identification of our species." So while Dr. Stål is not to blame for the statement that the insect figured by Madame Merian is found both in Surinam and Carolina, he evidently mixed several species in his identification of *tibicen*.

In 1903, in Bulletin No. 107, p. 91, Kentucky Agricultural Experiment Station, Professor H. Garman wrote as follows: "I am using this name [*Cicada pruinosa*] as a convenience without feeling wholly satisfied that this is Say's insect. The Kentucky material does not agree well with his description. The name has of late been regarded as a synonym of *Cicada tibicen*, but with this I can not agree. Two good species are here described, what-

ever the proper names may be. In response to a letter of mine calling attention to differences between the two, Dr. L. O. Howard suggests that as Linné described *C. tibicen* from a drawing by Madame Merian of a Surinam insect it may prove that neither of our species is *C. tibicen*.’’*

In 1907 Smith and Grossbeck in the April number of *Entomological News*, state in their “Studies in Certain Cicada Species,” that “The conclusions drawn from this study of the literature are that *C. tibicen* L. is not a North American species at all but that based on Merian’s figure, it is a common Central and South American species. . . . It seems strange that such large and common insects should have received so little careful attention. In most of the collections seen by us there were from two to five, and in one instance nine species under the name *tibicen*.’’

From the dates of the papers cited it will be seen that long ago *Cicada tibicen* was shown to be a South American insect, but nevertheless the name is still used in some recent papers on North American entomology, being applied to any one of several of our species that do not occur in Surinam, and which have scientific names of their own.

A comparison of the figure given by Merian with a collection of cicadas from Surinam and northern South America in general, shows that the species intended is much like what is known as *Fidicina mannifera* Fab. (1803), as pointed out by Uhler. It may be this, of which several of Walker’s species are placed as synonyms by Distant, or it may be an allied species of which there are also several.

It has at times been proposed that *tibicen* Linn. be the type of the genus *Cicada* Linn. (See *Canadian Entomologist*, November, 1914, p. 388.) If this ruling prevails then we must look to *Fidicina mannifera* Fab., or one of its close allies, which will become a synonym of *tibicen* Linn., for the characters of the genus, and not to such species as *linnei*, *lyricen*, *chloromera* and

* The species figured by Professor Garman are what were later named, by Smith and Grossbeck *Cicada linnei* and *Cicada sayi*. This last should be known as *Tibicen chloromera* Walker, an earlier name.

pruinosa from North America that have so often been listed as synonyms of *tibicen*.

***Tibicen robinsoniana* Davis.**

In the summer of 1921 thirty-two specimens including the types of this species were collected at Wingina, Nelson County, Virginia, as recorded in this Journal for March, 1922. In the summer of 1922 Colonel Robinson heard the first *robinsoniana* singing near his museum on June 25, and later sent me three that he had shot. Under date of September 22, 1922, he wrote: "All summer long I could hear *T. robinsoniana* in every direction, also many other species. The cats were as busy as usual [at dusk] and I don't see how any emerging cicadas escaped them."

In 1923 the writer was again at Wingina and found cicadas very scarce compared with 1921. The following note was made at the time: "When I came to Wingina there were several *Tibicen robinsoniana* in the tall oaks near the brook that runs down by the spring on its way to the river. About every time we passed that way we heard these cicadas singing; generally there were two or three of them. On August 4 we went to the place and found two singing in adjoining oaks, and one across the brook in a third large oak. One of these I saw with a field glass, but just then a severe thunder storm came up and we were obliged to leave. As we repeatedly heard these cicadas over a period of about two weeks it proves pretty well that there were none during that time in the woods to the north of the museum, where they were so numerous in 1921, or they would have made themselves heard, and it also proves that generally they do not wander far; they stay pretty much in the same locality. On August 4, 1921, Colonel Robinson shot 10 male *robinsoniana*, but this year we have not heard that many in the two weeks, and we have found no pupæ skins of any kind of a cicada, though they also were very common in 1921. It is also evident from these facts that cicadas of the genus *Tibicen* take longer to develop than the two years assigned to them in some of the present manuals on entomology.

On his way north to West Point later in the season of 1923, Colonel Robinson found *robinsoniana* more numerous in the

valley of the Shenandoah. At New Market there were three *robinsoniana* "singing in the little garden of the house where we spent the night." On August 22, "many *robinsoniana* singing at Berryville and some in the outskirts of Harper's Ferry, where we crossed the Potomac. None thereafter."

In 1924 *robinsoniana* was more plentiful about Wingina than in 1923, but not as numerous as in 1921. *T. robinsoniana* is also known from Missouri, as recorded in this Journal for March, 1923.

***Tibicen marginalis* Walker.**

This species was originally described from Missouri by Thomas Say, under the preoccupied name of *marginata*. It has been recorded by the writer in this Journal from Florida, Mississippi, Texas, Missouri, Kentucky, Ohio, Kansas and Colorado. To these states may now be added Louisiana, Arkansas, Tennessee, Indiana, Illinois, Iowa, Nebraska and South Dakota, from which specimens have been examined. The species seems to be almost confined to the watershed of the Mississippi River and its tributaries.

While the pronotum is often entirely green or yellowish green in this species, there is a rather conspicuous color variety with an irregular oblong, black spot, centrally, extending backward to the collar. Black lines sometimes lead from this spot each side into the oblique grooves. This variety probably occurs throughout the range of the species, but is much more common near its northern limit. When freshly emerged this cicada may have a dorsal row of pruinose spots on the abdomen, as in *dorsata*, *dealbata* and *cultriformis*, but is easily separated from them by the more bent fore margin of the front wings, very broad head, form of the uncus, as well as by color characters.

***Tibicen cultriformis* Davis. (Pl. V, fig. 2.)**

Up to the present time five specimens of this cicada, the largest known from the far western states, have been recorded. (See this Journal, December, 1915, and March, 1921.)

Recently Mr. George P. Engelhardt secured for me four males and two females; also some pupa cases. They came from a trust

company in Phoenix, Arizona, but the specimens themselves bore no locality labels. Two males and one female are fresh specimens each with a well defined dorsal line of pruinose spots on the abdomen, and the sides broadly margined with pruinose. All bear the black spot of peculiar shape on the pronotum referred to in the original description.

***Tibicen chiricahua* Davis.**

During the summer of 1924 Mr. Douglas K. Duncan sent me seven specimens of this species stating that he had taken them on the morning of June 9th, 1924, about three miles from Fort Apache, Navajo County, Arizona, on a high mountain plateau about 6,000 or 6,500 feet, devoid of any vegetation except many clumps of a large heavy grass. "There is much timber around the edges of this plateau, pine, cedar and juniper, but nothing on the plateau but the clumps of grass. The cicadas made such a noise and there were so many thousands of them that the shrill whistle was very annoying, but they were very active and hard to catch. They were invariably found on the tips or a little back from the tips of this grass."

In the collection of the U. S. National Museum there is a male of this species from Silver City, New Mexico. From bush (C. V. Riley, collection).

***Tibicen parallela* Davis. (Pl. V, fig. 3.)**

This species was described and figured in this Journal for March, 1923. At that time only the male type from New Mexico was known. In October, 1923, Mr. O. C. Poling sent to me a male and female, collected in copulation on the 5th of September, near an oak tree, Baboquivari Mountains, Pima County, Arizona, and also a single male collected in an oak at the same place on October 8, 1923. The female is here figured. In 1924 he sent a female collected in the same mountains on August 22. More recently a male from Sabino Basin, Santa Catalina Mountains, Arizona, September 4 (C. H. T. Townsend), has been received for examination from the U. S. National Museum.

In this Journal for March, 1921, *Tibicen cinctifera* Uhler is identified and *Tibicen apache* Davis separated therefrom as a distinct species. At that time there were in the writer's collection six cicadas that were not referred to in the description of *apache*, for though allied to it, they differed in some respects from the 150 or more typical examples. In this Journal for December, 1917, four of the six specimens are mentioned as belonging to a variety of *cinctifera* with "the hind margin of the pronotum more narrowly banded with orange."

During the summer of 1924, Mr. O. C. Poling collected in the Baboquivari Mountains, Pima County, Arizona, 242 additional cicadas belonging to the above mentioned variety, and to what is here named as a species related to *apache* and *cinctifera*. Several of our eastern cicadas that show no greater differences are clearly distinct as proved by their songs and habits.

Tibicen semicincta new species. (Pl. V. fig. 4.)

Type male and allotype female, Baboquivari Mountains, Pima County, Arizona, June, 1924 (O. C. Poling), Davis collection.

Resembles *Tibicen apache* described and figured in this Journal for March, 1921, but differs as follows: Generally smaller and with the triangular opercula usually more pointed and drawn out at the extremity; much darker in color, hind margin of the pronotum or collar with the front part blackish, the posterior portion greenish or greenish orange; eighth abdominal segment more extensively pruinose; pubescence at base of abdomen silvery, in *apache* it is golden; eyes darker, not reddish or reddish-brown as in *apache*. Costal margin of the fore wing to end of radial cell greenish with the radial vein darker; in *apache* both veins are orange.

Measurements in Millimeters.

	Male Type	Female Allotype
Length of body	24	24
Width of head across eyes	9	10
Expanse of fore wings	68	74
Greatest width of fore wing	10.5	11
Length of operculum	7	

In addition to the type and allotype the following are in the writer's collection, all from Arizona: Baboquivari Mountains, Pima County, 2 females (F. H. Snow); Baboquivari Mountains, Brown's Canyon, July, 1923, male and 4 females (O. C. Poling);

Baboquivari Mountains, June, 1924, 87 males, 112 females; July, 1924, 19 males, 22 females (O. C. Poling); Bonita, July 16, 1917, male (Dr. H. H. Knight); Tucson, Sabin's Canyon, Santa Catalina Mountains, July 23, 1917, 3 males (Dr. H. H. Knight); Lewis Springs, Cochise County, June 18, 1918, male (Harrold Morrison); Cochise County, June 23, 1919, male (received from professor F. M. Gaige), and two males labeled "Arizona."

The specimens collected in 1924 were found by Mr. Poling at from 3,000 to 5,000 feet, often "resting on Ocotillo." This plant is also called Candlewood (*Fouquieria splendens*). Among those collected in July, there were 22 individuals, both males and females, that had just matured, and were still pale in color as well as soft.

The following table will serve to separate *cinctifera*, *apache* and *semicincta*.

Opercula with outer edges nearly parallel to each other; 8th segment and middle base of tergum pruinose. Expands 75 to 85 mm.

Texas, New Mexico *Tibicen cinctifera* Uhler.

Opercula with outer edges converging; without central pruinose spot at the base of the tergum.

Hind margin of pronotum or collar yellowish or straw-colored; eyes reddish and membranes at base of both pair of wings pale; often straw-colored. Pubescence at base of abdomen golden. Expands 70-75 mm.

Arizona, California, Utah *Tibicen apache* Davis.

Hind margin of pronotum or collar with anterior portion blackish and posterior portion pale. Eighth segment pruinose, and pubescence at base of abdomen, silvery. Eyes darker than in *apache* (not reddish in dried specimens), and membranes at base of all wings darker gray. Usually smaller than *apache* and with opercula more extended at tips. Expands 65-74 mm.

Southern Arizona *Tibicen semicincta* Davis.

***Cicada hieroglyphica* Say.**

In 1921 Prof. R. W. Harned of Agricultural College, Mississippi, sent me a great many cicadas for determination. Among

them were some interesting color varieties of *hieroglyphica*. Up to that time I had seen several hundred of the usual form from Long Island, N. Y., New Jersey, Maryland, Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Arkansas, Kansas, Missouri and Tennessee, as well as the variety *johannis* from peninsula Florida in which the markings are much lighter in color and the irregular thoracic stripes reduced to spots.

Some of the specimens collected in Jones County, southern Mississippi, in 1920 and 1921 by Mr. Albert Breland belong to a variety having the head, pronotum and mesonotum almost wholly black, in fact in two specimens the mesonotum is entirely black except inconspicuous paler marks on the elevated \times . Mr. Breland wrote that he had taken the cicadas in oak and mulberry trees and some in a peach orchard.

An examination of a series of the closely allied *Cicada orni* L., kindly collected for me in Spain by Dr. M. D. Leonard in 1924, shows that in that species there is also a tendency to produce dark colored individuals.

Magiccicada, new genus.

According to Distant's Catalogue of Homoptera, Part I, Cicadidæ, 1907, p. 125, and Van Duzee's Catalogue of Hemiptera, our native Seventeen-Year Cicada belongs to the Genus *Tibicina*. *Cicada hæmatodes* Scopoli of Europe was placed in the genus *Tibicina* by Amyot, Ann. Soc. Ent. France, 1847, p. 154, and by Kolenati in 1857 (See Van Duzee's Catalogue of Hemiptera). Distant designated it the type of the genus in 1905, Ann. Mag. Nat. Hist., Series 7, XVI, p. 22.

An examination of *Tibicina hæmatodes* shows that it is correctly placed next to our North American species of *Okanagana* in the Distant catalogue. The uncus is exposed and can not be withdrawn into the abdomen, the tympana are wholly uncovered and the form and coloring are as found in many species of *Okanagana*. *Tibicina hæmatodes* has, however, proportionately broader wings and a more robust body than is usual in *Okanagana*.

An examination of the Seventeen-Year Cicada shows that it is not closely related to *hæmatodes* and should not be in the same genus with it. The uncus, as described and figured by Dr. Paul B. Lawson, Kans. Univ. Sci. Bulletin, Vol. XII, 1920, when viewed laterally, has the form of a triangle with its apex bent strongly cephalad. "Viewed caudally it has the form of two sclerites extending downward from the anal tube, encircling the penis, and widening below it into two triangular processes which taper to acute apices" or hooks. It can be withdrawn into the abdomen which is long, almost parallel sided, and not tapering as in *hæmatodes*. The first cross vein of the fore wing starts near the base of the first marginal cell, instead of near its center, and the second cross vein is quite close to the first, instead of being more than its length away as in *hæmatodes*. The wing venation in some respects resembles more closely that of *Sena* (*Cicadatra*) *quærule* Pallas, but in that insect the tympana are partly covered. See Monograph Oriental Cicadidæ, Distant, Tab. XII, Fig. 2.

Fabricius placed *septendecim* in the genus *Tettigonia*, but that name is used in *Orthoptera*, and *Tettigonia verrucivora* Linn. of Europe and Asia, is given as the type in Kirby's catalogue, 1906, p. 212.

Tibicen Latreille has also been used by some authors for *septendecim*, commencing with Stål, 1861, but Mr. Van Duzee shows in the Canadian Entomologist, November, 1914, p. 387, that Latreille used the name for *plebeja* in 1825.

It is evident from the foregoing that our well known red-eyed Seventeen-Year Cicada does not belong where it has been placed, in fact Distant states in his 1905 paper, already cited, in describing his Division *Tibicinaria*, that *Tibicina septendecim* "possesses several aberrant characters." The writer therefore proposes that this important and interesting species be the type of a new genus and be called *Magicicada septendecim* (Linn.).

Magicicada cassinii Fisher.

In the collection of the Iowa State College of Agriculture and Mechanic Arts, there is a female *M. cassinii* Fisher dated Ames, Iowa, October 11, 1912.

In this journal for December, 1919, the writer recorded another *cassinii* collected October 15, 1919, by Miss Mary E. Dewey, of Luray, Clark County, Missouri. Attention had been called to the insect by hearing it sing.

Magicicada septendecim and *M. cassinii*, that normally appear in May and June, are usually dead by mid-summer, and a sad blemish in entomological literature may be found in the acrimonious discussion between the botanist Prof. Lester F. Ward, who stated that he had heard a 17-year cicada singing on October 12, 1884, near Clifton Station, Virginia, and Dr. C. V. Riley who thought, owing to the lateness of the date, that it was likely some other species of cicada. However, in reading the controversy published in *Science*, June 12 and July 3, 1885, and the *Scientific American Supplement*, August 15, 1885, we find that both gentlemen were incorrect in some particulars as we think we see the truth to-day.

We may here add that the song of *cassinii* does not at all resemble that of *septendecim*, but is "more like that of some of the grasshoppers" as stated by Dr. G. C. Fisher. Some of the differences between *cassinii* and *septendecim* were pointed out by Dr. Hildreth in *Silliman's Journal* as early as 1830, and by Dr. Fisher and John Cassin in *Proc. Acad. Natural Sciences of Philadelphia*, September, 1851. In some of the 17-year broods the eyes in the small form are certainly much more prominent than in *septendecim*.

Okanagana bella has a wide distribution extending from western Kansas and South Dakota to British Columbia and the states of the Pacific coast. In the original description of the species in this *Journal*, 1919, p. 199, is the statement "Valve black, sometimes orange at the sides along the upper margin. In some of the specimens from Colorado the valve is entirely orange." Since 1919 a considerable number of males with light colored valves have been examined. Records of 47 individuals have been made and a considerable number are also in the writer's collection from Laremer, Jefferson, Douglas, El Paso and Summit Counties, Colorado. These localities, with the exception of Summit County which is in the mountains, are east of the continen-

tal divide. From the last mentioned county one male with a black valve is at hand, in the others the valve is reddish. Typical *Okanagana bella* may, however, occur east of the divide, and we have specimens from South Dakota that are like those from British Columbia. For some reason those from the above mentioned counties in Colorado, the first four in particular, differ from the usual and seem to be worthy of a variety name.

***Okanagana bella* var. *rubrocaudata*, new variety.**

Type male and allotype female, both from Plainview, Jefferson County, Colorado. The male was collected in July, 1922, by Mr. George P. Engelhardt, and the female, June 23, 1922, by Mr. Oslar. Davis collection.

Valve at the extremity of the abdomen in the male is deep orange or reddish in color instead of black, the last ventral segment is almost entirely reddish, the black being reduced to a narrow band at base and the remaining segments also have the black much reduced. The 8th and 9th dorsal segments are conspicuously margined with reddish, instead of the red being reduced to a line. In the female the 8th dorsal segment is more broadly margined with reddish, and beneath, the last segments are also more reddish in color.

***Okanagana lurida* Davis.**

A second example of this species has been discovered in the collection of the U. S. National Museum. It is a male collected at Pulman, Washington, by C. V. Piper, as was the type, with which it closely agrees.

***Okanagana nigriviridis* Davis.**

This beautiful green and black cicada was described in this Journal for March, 1921, p. 9, from four specimens collected at Upland, San Bernardino Co., California, in July, 1920, by Miss Esther P. Hewlett.

Mr. George H. Field has since sent to me a female collected at Warner's, San Diego Co., Calif., in June, 1922, early one morning as he climbed a mountain road. It had just emerged from its pupa case which was lying beside it.

***Okanagana viridis* Davis.**

This almost entirely green insect, and the only member of its genus so far reported from the southeastern United States, was

described in this Journal for Sept.-Dec., 1918, p. 153, from a male and female collected at O'Reilly, Mississippi, in the bottom land along the Mississippi River.

On August 9, 1921, Prof. R. W. Harned, Agricultural College, Mississippi, very kindly sent me a male *viridis* and wrote as follows: "On August 4th Mr. A. E. Terry, one of my former students, who lives about ten miles from here, brought to the office a male of *Okanagana viridis* that he had collected the previous day. He had placed the specimen in a small tin box. It was still alive when he brought it to us, and I placed it in a breeding cage where it remained alive for several days. I did this so as to give the insect a chance to change its coloring if it was going to do so.

"The next day after the specimen was brought to me, Mr. Kimball and I went out to Mr. Terry's farm to see if we could not find some more specimens of this interesting cicada. He took us to the woods where he had found the specimen, and went right to the small shrub from which he had collected it. The plant was a small hawthorne not more than ten inches high. On the ground beside this plant, I found the pupa skin from which the specimen had probably emerged. Within a radius of five yards from the spot where this cicada had been collected we were able to find 20 cast skins of what is apparently the same species. I am mailing ten of these to you.

"The cicada and the cast skins were collected under an old black jack oak tree. This was in an old woods that I am certain has never been cleared. The large trees in this woods are mostly black jack and post oaks. The particular tree under which we found these specimens is only a few yards from an open field that has probably been farmed for many years. We could not find any cast skins under other trees in this woods, although we searched faithfully for several hundred yards from this tree in three directions. We did not search in the open pasture to the west. This woods is on comparatively high land. It is located about four miles south of Sessums, Mississippi, and about ten miles from the college.

"This specimen was something of a surprise to me as I had not been expecting to get this species from this section of the state."

On July 1, 1923, Miss Louise Knobel collected a male *viridis* on a boneset growing in a wood at Hope, Arkansas, and in her letter stated that the specimen was "hard and dry when captured."

On July 11, 1923, Mr. W. J. Clench collected a female *viridis* at Memphis, Tenn. The specimen has been examined by the writer, and is in the Museum of Zoology, University of Michigan, at Ann Arbor.

While the five specimens here mentioned have come from three adjoining states, the actual area of distribution of the species thus recorded is really not very great.

***Clidophleps vagans*, new species.** (Pl. V, fig. 5.)

Type male, southern part of California, 1922 (From Victor Duran). Deposited in the American Museum of Natural History.

Head as broad as the front margin of the pronotum; front produced but not as broadly triangularly so as in *Clidophleps astigma*; it is nearer in form to that of *C. distanti*. Median sulcus of the front well defined. Pronotum with the humeral angles rounded; the anterior angles more broadly rounded than in *astigma*. In *distanti* the anterior angles are more pronounced. The opercula with the extremities rounded. Last ventral segment somewhat truncate at extremity. Uncus when viewed in profile bent downward at extremity and deeply sinuate on the lower surface of the apical half; about as long as the valve. In *astigma* and *distanti* it is shorter than the valve. Basal cell of the fore wings clear; of the same shape as in *astigma*. Costa of the fore wings yellowish to the end of the radial cell, brownish beyond; membranes of both pair of wings yellowish. The fore wings are proportionately narrower than in *distanti*, the costal margins are more evenly curved, the central portions are not so much bulged outward, or upward when the wings are expanded, and the "triangular fuscus nodus" at the outer end of the cubital cell is reduced to a mere thickened vein. The fore wing is of the same narrow type as in *astigma*, but the radial area is proportionately narrower.

General body color yellowish variegated with black. Front of head black, with an interrupted and broken black band between the eyes. Beneath, the head is black margined with yellow on each side of the transverse rugæ; the median sulcus is centrally black, yellowish at extremities. Pronotum yellowish with the following black: centrally with two nearly parallel lines broadest at the anterior extremities, each side of which

are three short broken lines the outer one expanding on the fore part of the collar each side into a rather conspicuous spot. Mesonotum yellowish with four obconical, lacerated black spots extending backward from the anterior margin; the central pair shortest with a wedge-shaped spot behind them. Two black dots near the extremities of the anterior arms of the yellowish mesothoracic cross. Metanotum pale with a curved black mark near the base of each wing. Dorsum of the abdomen yellowish, each segment with the basal part black; densely covered with silvery hairs especially at the base of each segment. The uncus and valve are pale, also the under-side of the abdomen. The legs are pale striped and spotted with brown.

Measurements in Millimeters.

	Male Type
Length of body.....	23.5
Width of head across eyes.....	6.5
Expanse of fore wings.....	57
Greatest width of fore wing.....	10
Length of valve.....	4

In his letter of November 12, 1922, Mr. Victor Duran states: "The light colored specimen was found by my brother-in-law in his machine after having driven from Mammoth to Los Angeles. I presume it came in somewhere in the Owen's Valley."

This species is nearest to *astigma* but may be separated by its larger size, shape of the front of the head; the radial cell, and the valve. It further differs in color pattern as described.

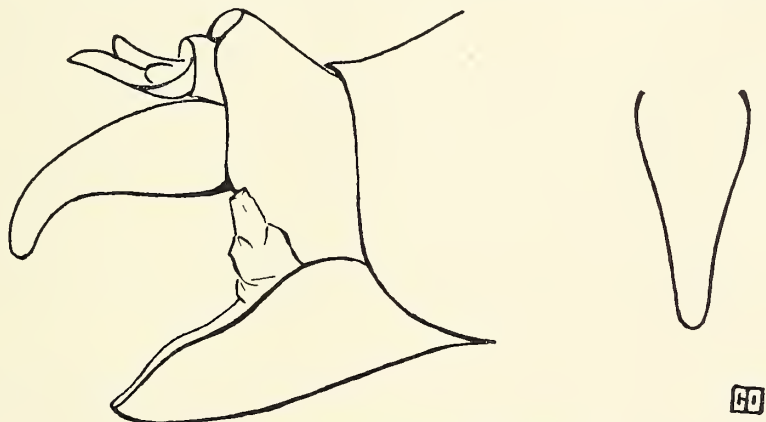


FIG. 1. *Clidophleps vagans*

Melampsalta camerona Davis.

Described in this Journal for June, 1920, from two males and a female from Brownsville, Cameron Co., Texas. Lately Mr. F. F. Bibby has sent me a male from La Feria, Cameron Co., Texas, May 2, 1924. This specimen has five marginal areas in

the right hind wing and four in the left. The right fore wing has eight marginal areas, and the left but seven.

Pink Cicada Mutants.

In 1923 Dr. Raymond H. Beamer, University of Kansas, kindly sent to me for examination 315 specimens of the two species of *Melampsalta* found in Kansas. They were collected mostly in Kiowa and Ellsworth Counties. Of these 292 were *calliope* Walker (*parvula* Say), and 23 *kansa* Davis. All of the specimens of *kansa* were green in color, but among the *calliope* were two pink females as follows: Kiowa Co., Kans., July 6, 1923, (C. H. Martin), and Ellsworth Co., Kans., July 12, 1923, (C. H. Martin). Mr. Warren Knaus was also on this collecting trip to Kiowa Co., and he sent to me a pink female *calliope* collected July 6, 1923. The remaining specimens of *calliope* collected on this expedition were either straw-colored or straw-colored slightly tinged with green.

In Florida *calliope* is usually all green or greenish in color and of slender proportions. Of this form (var. *floridensis* Davis) Prof. Frederick M. Gaige, Ann Arbor, Michigan, has kindly sent to me for examination the following pink mutants: Alachua Co., Fla., Aug. 5, 1923, male (Alexander—Walker) and Enterprise, Volusia Co., Fla., female (F. Walker).

In 1924 Dr. Harry H. Knight sent to me for examination 89 specimens of *Pacarina puella* Davis (*signifera* Walker, name preoccupied), collected in Eastland Co., Texas, during the month of May, 1921, by Miss Grace O. Wiley. A considerable number of the specimens were taken at light. For the most part they were of the usual color, but several of them were somewhat pink, especially the under parts and the basal membranes of both pairs of wings.

It is of course not unusual to find pink individuals among a number of species of Homoptera, especially where the usual color is green or straw-color as it is in the cicadas here mentioned.

Vespa Crabro as a Cicada Killer.

On September 18, 1924, at Rye, N. Y., Mr. Henry Bird saw the large naturalized wasp *Vespa crabro* capture in mid air a

cicada. The insects struggled for a moment and then both came to the ground together. Mr. Bird has kindly presented them to me, and I find the cicada to be a female *Tibicen lyricen* De Geer.

This is the second instance that has come under the writer's notice of this large wasp attacking a cicada. The first case was mentioned in connection with other cicada killing insects in this Journal for June, 1924. It occurred at Arrochar, Staten Island, September 10, 1916, when Prof. Wm. S. Wright, Edw. J. Burns and I witnessed a living *Tibicen chloromera* (*sayi*) being devoured by a *crabro*. We had, however, no proof at the time that the cicada had been captured by the wasp, but it now seems likely that it actually was. *Vespa crabro* catches cicadas to eat, whereas the considerably larger *Sphecius speciosus* collects them as food for its young, and often stores away a considerable number in a single burrow.

EXPLANATION OF PLATE V

- Fig. 1. *Cicada tibicen* Linn. Surinam, S. Am.
- Fig. 2. *Tibicen cultiformis*. Arizona.
- Fig. 3. *Tibicen parallela*. Arizona.
- Fig. 4. *Tibicen semicincta*. Type. Arizona.
- Fig. 5. *Clidophleps vagans*. Type. California.

NOTES ON LEPIDOPTERA AND HYMENOPTERA

BY FRED M. SCHOTT

BROOKLYN, N. Y.

Hemerophila pariana Clerck.

This European moth, first reported by Dr. E. P. Felt in 1917 from Westchester County, N. Y., and the subject of a detailed bulletin by Porter and Garman,—No. 246 Apple & Thorn Skeletonizer, Conn. Agr. Exp. Sta., Feby., 1923, has found its way into northeastern New Jersey, where it is now well entrenched.

During August the writer had occasional opportunity to observe the insect at Nutley in Essex County, where there appeared a rather severe outbreak in an apple orchard. It was also noted in Passaic Co., at Haledon and, by Dr. M. D. Leonard, about Pompton. In Bergen Co. it occurs at North Hackensack, River Edge, Oradell, Spring Valley section and Rutherford (1 specimen). The most southerly points were Irvington and West Orange, Essex County. In going over material collected earlier in the season I discovered a single specimen from Central Park, Long Island, N. Y., dated April 20, 1924. It would seem, then, that the species may ultimately spread over a considerable area in the East.

On August 6th, at Nutley, the adults were awing in numbers. They have an erratic manner of flight, not long sustained, and may be recognized at a distance by the characteristic posture when at rest. The wings are held partly upraised at a ready-to-go-angle. Those raised from cocoons were mostly of the typical color, dark reddish-brown with a suggestion of purplish and with patches of grayish at the costal margins. Others varied to the extent of having the gray markings spread more or less across the wing.

The green, black-tubercled larvae were almost all full grown (about $\frac{1}{2}$ inch) on this date. They are active, when disturbed, "shimmie" like a burlesque comedienne, and will thrust themselves into space on a silken thread, after the manner of many

other caterpillars. While usually there is spun a single cocoon along the midrib, many leaves had attached three or more, both on the upper and lower sides, often in the curls produced at the tip and sides by the feeding larvae. Individuals sometimes migrate and spin cocoons on an uninjured leaf.

Leaves with larvae were gathered and put into jars on August 6. These emerged between the 13th and 18th. From cocoons gotten on the 18th the moths emerged 25th to 30th. The pupal shell remains well extruded from the end of the case after the adult has emerged. Fortunately the progress of this species is beset with greater difficulties than has been the case with most other pests of foreign origin. It is readily amenable to arsenical reasoning.

From the cocoons were bred, a Chalcidoid parasite, *Dibrachys boucheanus*, Ratz.,¹ (a tent caterpillar enemy) and *Epiurus indagator*, Cress.,² (Ichneumoninae). Five other hymenopterous species appeared—*Itoplectis conquisitor* Say² (Ichneumoninae), *Triclistus curator* Fab.,² (Tryphoninae), a Pteromalid, and a *Horismenus* species¹ (Chalcidoidae). A cluster of curious black cases, about one-eighth inch long, set on end about the midrib near a cocoon, brought to light a number of chalcidoids, *Comedo anomocerus* Crawford.¹

As the writer does not know definitely whether there is any parasitic connection between these five and any stages of *Hemerophila*, they are given only as a matter of record. The list of parasites in the report of Porter and Garman mentions several others, both hymenopterous and dipterous. Furthermore, there was in this orchard another controlling factor scarcely less interesting than the list of discovered parasites. Hemiptera of the genus *Sinea* were present in numbers and feeding on the larvae. Two specimens taken proved to be *Sinea spinipes* H. S. While these reduviids are of general distribution and not uncommon in this region, their extraordinary abundance on the trees makes very tempting the assumption that they were attracted

¹ Det. by A. B. Gahan.

² Det. by R. A. Cushman.

solely by the *Hemerophila* caterpillars. Often, upon turning over a leaf fold to look for larvæ, there would be, instead, a *sinea*, wearing an "expression" that, under the circumstances, I may be pardoned in terming "pleasurable satisfaction."

As the common name of "Apple & Thorn Skeletonizer" is considered unsatisfactory, the writer takes the liberty of suggesting "Flit Moth" or "Apple Flit Moth," from the above-described manner of holding its wings when resting.

***Tortrix pallorana* Rob.³**

On July 31 considerable damage was being done to rose foliage at Murray Hill, N. J., by the larvæ of this species. It is a leaf-rolling insect and its work resembles that of the common rose pest *Cacæcia rosaceana* Harris. The caterpillar is a bluish-green, about three quarters of an inch long, and has on the hind dorsal surface a conspicuous yellow patch. From larvæ collected there was raised an Ophionid parasite, *Campoplex ferrugineipes* Ashm.²

***Olethreutes habesana* Wlk.³**

The small light colored larvæ of this elegantly marked Tortricid were found infesting the terminal shoots of the false dragon head, *Physostegia* sp., causing a withering and blackening of the foliage. Those raised, pupated in the folds of the leaves, which would seem to indicate that the larva leaves the burrow in the stem when ready to change. The moths emerged from cases that had been pushed almost entirely out of the fold before emergence. This species is recorded by Smith as feeding on a variety of plants, such as Mullein, Gerardia and Verbena.

***Olethreutes hemidesma* Zell.³**

The galleries of this were abundant on *Spiræa* in the vicinity of Rutherford in August. Often a number of the terminal leaves were rolled along the stem, making chambers four or five inches in length. Dozens of the galleries might have been taken from a single shrub. The larva is about one half inch in length, has a brown head and thoracic shield. The segments are black

³ Det. by August Busck.

and bear rather large white tubercles. From them, collected on August 7th, adults emerged on the 20th. A species of *Epiurus*² (Ichneumoninæ) was obtained.

Erannis tilaria Harr.

In place of the usual fall incursion of the cotton moth, *Aletia argillacea* Hbn., this species has descended upon New York City and environs in great numbers this year. Seems to have voluntarily lent itself as an external decoration to every store window.

STATISTICAL METHOD AND ENTOMOLOGY

Of late there appears to be a tendency on the part of some entomologists, particularly economic ones, to utilize statistical method as a means of interpreting entomological data. There is no doubt concerning the validity of such a procedure and the tendency should be encouraged. However it should be remembered that where the premises are doubtful, the conclusion must be tentative and mathematical methods should not be used to give a false accuracy or an appearance of reconditeness to the work.

Professor Arne Fisher in his review (Jour. Amer. Statis. Assoc. vol. XIX, pp. 413-418, 1924) of the "The Calculus of Observations" by Whittaker and Robinson calls attention to the numerous workers in different branches of learning who are busily engaged in calculating coefficients of correlation between all sorts of phenomena. He is of the opinion that these are wasted efforts and states that "Jørgensen, in his great work on Frequency Surfaces and Correlation, has declared that the concept of correlation is as yet in a nebulous state and that it will take the diligent, meticulous and serious labors of many mathematicians to build even a firm basis for the theory." Fisher states that Whittaker's chapter on this subject confirms the view of Jørgensen and advises statisticians to wait until the mathematicians have reduced the concept to a more solid basis.

Ed.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY

MEETING OF FEBRUARY 5, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M., on February 5, 1924, in the American Museum of Natural History, President Harry B. Weiss in the chair and 13 members and two visitors present.

Mr. Nicolay spoke on "Winter Sifting for Coleoptera" and exhibited a box of his captures by this method of collecting. He commended sifting for the occupation it afforded outdoors when other methods were unseasonable as well as for the species it yielded and emphasized its uselessness in recently burned areas. On Long Island he had found good places to sift at Rosedale and Wyandanch; in New Jersey at Lakehurst and Roselle Park; and some good species had been found on Staten Island. The prizes for him had been *Pselaphidae*, especially *Brachygluta terebrata* from Roselle, *luniger* and *cavicornis* from Staten Island; *Bythinopsis tychoides* and *Pselaphus erichsoni* from Roselle, where a sphagnum bog was rich in such species.

Mr. Leng recalled that the same sphagnum bog at Roselle was the place where Mr. Barber and others had found *Boreaphilus americanus* Notman.

Mr. Davis described how Wyandanch had originally been selected as a collecting place from study of maps and how the little pond Mr. Nicolay visited had been originally detected by the frog songs issuing therefrom.

Mr. Notman spoke on "Western Coleoptera captured in 1923," referring particularly to his visits to Fargo and Minot, North Dakota, in the drainage basin of rivers running to Hudson's Bay, and Williston, North Dakota, and Great Falls, Montana, on rivers tributary to the Missouri. He tabulated over 1,200 specimens of *Bembidion*, representing 31 species, showing thereby a sharp difference between the two basins. Among other species of interest that he found along the river banks were *Dyschirius setosus* under leaves in dry runs and *Heterocerus* sp., in very sticky mud. About ten days were devoted to intensive collecting in the localities described.

Dr. Bequaert expressed admiration for the industry displayed by Messrs. Notman and Nicolay in collecting, mounting and studying such quantities of small and obscure beetles, and remarked that the New York Society was somewhat unique in the number of specimens shown at its meetings. He spoke also of the New York State List and advocated the printing separately of each order as MSS. was made ready.

Dr. Garman spoke of the ravages of the introduced *Anomala orientalis* in Connecticut, especially in destroying lawns, 100 larvæ having been found in one square yard. Fortunately thus far no serious damage had been done by adults. He spoke also of the possibility of a work on Connecticut Odonata being prepared.

Dr. Rohwer spoke of the continually increasing demand for entomological service at Washington, especially in detecting the accidental introduction of phytophagous insects.

Mr. Davis exhibited a *Polistes pallipes* found by Mr. Brower, of Willard, Missouri, eating a dying *Cicada hieroglyphica* on July 4, 1923, and commented on this unusual behavior of *Polistes*. He also exhibited a copy of American Forestry and Forest Life, containing an article by Mr. Weiss on scouting for Gypsy Moth in New Jersey.

MEETING OF FEBRUARY 19, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M. on February 19, 1924, in the American Museum of Natural History, President Harry B. Weiss in the chair and 14 members and three visitors present.

Frank Johnston, 60 Douglas Road, Glen Ridge, N. J., and Perry A. Glick, 305 Custom House, New York City, were, on nomination by Messrs. Watson and Weiss, respectively, elected active members, the by-laws being suspended for the purpose.

Mr. Shoemaker exhibited six boxes of *Morpho* butterflies, describing the characteristics and origin of each. He said in part that his collections contained more than half of the described species and quoted from Bates, "It is a grand sight to see these colossal butterflies by twos and threes floating at a great height in the still air of a tropical morning," and expressed his great regret that he had never seen them alive.

Mr. Hallinan said that he had taken several hundred at Panama, but only three species, usually shortly after sunrise or after rain. The females were rare because they remained in the deep jungle. He discussed various methods used in taking them and spoke of the superstitious objections to their capture encountered in Peru.

Mr. Davis exhibited Cicadas and other insects killed by wasps and robber flies and read from a paper on the subject, which will be printed in full. He also exhibited *Neonympha phocion* (*areolata* Sm. & Abb.) and its varieties and spoke of its nomenclature and geographic variation. His remarks will be printed.

Mr. Weiss exhibited copies of the Scientific Alliance Bulletin of 1906, which had been saved by Mr. Dickerson, and copy of the "American Mercury," containing an article by H. M. Parshley on Heredity, with a criticism thereof from the "New Republic."

MINUTES OF MEETING OF MARCH 4, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M. on March 4, 1924, in the American Museum of Natural History, President Harry B. Weiss in the chair, with 15 members and three visitors present.

Mr. Nicolay for Field Committee reported a trip for following Sunday open to all who desired to go out.

Mr. Davis called attention to the retirement of Mr. John D. Evans, Trenton, Ont., now 81 years old.

Mr. Lutz, in the absence on account of illness of the announced speakers, read extracts from his forthcoming paper in reference to some apparently selective characters and the facts brought out by his studies of ultra-violet rays.

ENTOMOLOGY IN THE DIARY OF SAMUEL PEPYS

In "Passages From the Diary of Samuel Pepys," a volume of The Modern Library published by Boni and Liveright, New York, one finds the following references to insects:

1664, July 18. "To Westminster to my barber's, to have my Periwigg he lately made me cleansed of its nits, which vexed me cruelly that he should put such a thing into my hands."

1664, September 3. "I have had a bad night's rest to-night, not sleeping well, as my wife observed, and once or twice she did wake me, and I thought myself to be mightily bit with fleas, and in the morning she chid her mayds for not looking the fleas a-days. But, when I rose, I found that it is only the change of the weather from hot to cold, which, as I was two winters ago, do stop my pores, and so my blood tingles and itches all day all over my body, and so continued to-day all the day long just as I was then."

1669, January 23. "So to my wife's chamber, and there supped, and got her cut my hair and look my shirt, for I have itched mightily these 6 or 7 days, and when all comes to all she finds that I am lousy, having found in my head and body about twenty lice, little and great, which I wonder at, being more than I have had I believe these 20 years. I did think I might have got them from the little boy but they did presently look him, and found none. So how they come I know not, but presently did shift myself, and so shall be rid of them, and cut my hair close to my head, and so with much content to bed."

Ed.

COLEOPTERA IN OCEAN DRIFT

During a season's collecting on the New Jersey coast, in 1924, about a mile below Seaside Park, the following species, kindly identified by Mr. C. A. Frost, were taken on the beach in the washup. Carabidæ: *Platynus cincticollis* Say, July 2, *Callida purpurea* Say, July 2. Staphylinidæ: *Diachus thoracicus* Csy., June 16. Histeridæ: *Hister immunis* Er., July 2. Lampyridæ: *Celetes basalis* Lec., July 2, *Photuris pennsylvanica* DeG., July 2, 15, *Podabrus basilaris* Say, July 2. Bostrychidæ: *Bostrychus bicornis* Web., July 15. Scarabæidæ: *Ochrosidia villosa* Burm., July 15. Cerambycidæ: *Criocephalus obsoletus* Rand., July 15, *Prionus laticollis* Dru., July 15, *Calloides nobilis* Say, July 2, *Purpuricenus humeralis* Fab., July 2, 15, *Monohammus titillator* Fab., July 15, *Liopus cinereus* Lec., July 15, *Astylopsis guttata* Say, July 15, *Pogonocherus mixtus* Hald., July 2. Chrysomelidæ: *Leptinotarsa 10-lineata* Say, May 29. Cistelidæ: *Isomira sericea* Say, July 15. Melandryidæ: *Synchroa punctata* Newm., July 15. Oedemeridæ: *Nacerdes melanura* Fab., July 2. Mordellidæ: *Mordella octopunctata* Fab., July 15. Curculionidæ: *Conotrachelus posticatus* Boh., July 2, *Conotrachelus naso* Lec., July 15. Calandridæ: *Sphenophorus striatipennis* Chitt., May 29.

HARRY B. WEISS AND ERDMAN WEST,
New Brunswick, N. J.

The New York Entomological Society

Organized June 29, 1892—Incorporated June 7, 1893

The meetings of the Society are held on the first and third Tuesday of each month (except June, July, August and September) at 8 P. M., in the AMERICAN MUSEUM OF NATURAL HISTORY, 77th Street and Eighth Avenue.

Annual dues for Active Members, \$3.00.

Members of the Society will please remit their annual dues, payable in January, to the treasurer.

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JOURNAL

OF THE

New York Entomological Society

VOL. XXXIII

JUNE, 1925

No. 2

SOME NEW OR LITTLE-KNOWN HEMIPTERA FROM FLORIDA AND GEORGIA¹

BY ROLAND F. HUSSEY

NEW YORK CITY

The following notes are based largely upon a collection of Hemiptera which was recently submitted to me for determination by Mr. T. H. Hubbell, of the University of Florida. These specimens, which were collected by Mr. Hubbell and by Mr. F. W. Walker, were obtained principally from various localities in the northern part of Florida, but there are also a number of specimens in the collection from several places in northern Georgia. This material has proved unusually interesting, since it includes specimens taken in every month of the year. A number of the species have not previously been known from these states, while a few are new to science. I hope to publish a complete list of the species later, and in the present paper I shall deal only with some of the forms which seem to be undescribed, or which are otherwise noteworthy.

SCUTELLERIDAE

***Diolcus chrysorrhoeus* (Fabr.).**

This species appears to vary in some of its structural characters to a certain degree. The odoriferous orifices are located

¹ Contribution from the Biology Department of the Washington Square College, New York University.

almost midway between the hind coxæ and the lateral margin of the metastethium, usually a little nearer to the coxæ; but in two Florida specimens before me they are distinctly nearer to the lateral margin of the pleuron (6:7) than to the coxæ. By a strict application of Schouteden's synopsis of the Scutellerid genera (1904, Gen. Ins., Fasc. 24, p. 43) these specimens run out to the genus *Polytes* Stål, but specifically they are scarcely separable from *D. chrysorrhæus*. It may be noted that in his generic description of *Diolcus*, Schouteden (op. cit., p. 56) erroneously states that the second rostral segment is as long as the third and fourth united. This condition is almost, but not quite, attained in the genotype, *D. irroratus* (Fabr.), but in the other three species now assigned to the genus the second rostral segment is distinctly shorter.

CYDNIDAE

Galgupha ovalis, new species.

Broad, very slightly obovate, shining black, the antennæ and tarsi testaceous; lightly but distinctly punctate except on the disc of both the pronotum and the scutellum, where the punctures are most obsolete. Head, including the eyes, twice as wide as long, flattened on the disc near the apex, the lateral margin distinctly thickened but not at all reflexed, the jugæ without oblique impressions; ocelli about five times as far from one another as from the eyes (36:7); third antennal segment less than twice as long as the second (11:6); rostrum reaching middle coxæ. Pronotum almost twice as wide as long (25:13), the sides more strongly vertical than in *nitiduloides*, the lateral margins almost uniformly convexly rounded. Scutellum not abruptly declivous behind the middle. Corium formed almost as in *nitiduloides*, the impressions somewhat shallower and continued somewhat farther back. Venter strongly punctate. Sixth ventral segment of the male very deep at the center, depressed in the inner apical angles next the genital segment. Male genital segment four times as wide as long, strongly concave longitudinally, almost flat transversely. Anterior femora with three subapical spines, the middle one much the longest; anterior tibiæ with four antero-dorsal spines on the proximal portion, followed by one or two weaker spinules.

Length (♂), $4\frac{1}{4}$ mm.; humeral width, 3 mm.

GEORGIA: Macon, 6. iv. 1923 (T. H. Hubbell). Type in my collection.

In Malloch's key (1919, Bull. Ill. St. Lab. Nat. Hist., xiii, p. 211) this species runs to *nitiduloides*, from which it may be distinguished by its different form, proportionally broader at the humeral angles and more distinctly narrowed behind, its shorter third antennal segment (in *nitiduloides* the third segment is two and one half times as long as the second), the lack of oblique impressions on the jugæ, the unreflexed margin of the head, and the very differently formed sixth ventral segment of the male. It is at once distinct from *aterrima* Malloch by the arrangement of the spines on the fore legs and the form of the scutellum.

***Geocnethus cavicollis* (Blatchley).**

I have before me one male and three females of this species, taken by Mr. Hubbell at Gainesville, Florida, in September and October, 1923. They were found buried a short distance in loose grayish sand, thinly covered with dead leaves, pine needles, and other debris, upon the University campus.

The original description of this species given by Blatchley (1924, Ent. News, xxxv, p. 85) is very brief and requires some amplification, and Blatchley's location of it in the genus *Geotomus* is incorrect. This is the first recorded nearctic species of the genus *Geocnethus* Horváth (1919, Ann. Mus. Nat. Hung., xvii, p. 245). The following notes will supplement the original description.

Head $1\frac{1}{7}$ longer than its width between the eyes; apical margin smoothly rounded, not at all emarginate at the apex of the tylus; jugæ coarsely punctate, their surface uneven, the lateral margin somewhat callously thickened, sometimes piceous; each jugum with only the three discal erect cilia, marginal cilia lacking; eyes triangular, with a single spinule externally; ocelli four times as far removed from one another as from the eyes; bucculæ increasing in height posteriorly, coarsely punctate, their margins lightly sinuate, reaching the base of the head and concealing the entire first rostral segment. Pronotum slightly more than twice as wide as its median length, laterally coarsely punctate in front of the large setigerous puncture and with a few irregular punctures behind this, the lobes separated only by an

incomplete transverse row of close-set punctures; anterior lobe (♂) with a broad deep impunctate concave depression at the middle, or (♀) with a simple obsolete transverse impression; lateral margins almost straight, provided with four or five setigerous points. Costal margin of the corium with a subbasal setigerous puncture, and a second one just before the middle; exocorium sparsely and irregularly punctate, except on the basal third; mesocorium with a submarginal impressed line extending about two-thirds the length of the corium, thence continued to the apical margin as a series of punctures; median field of the mesocorium with one or two rather irregular rows of punctures on its basal third, and a nearly complete row next the claval suture, the apical portion of the corium otherwise impunctate; membrane not attaining the apex of the abdomen in either sex. Ostiolar canal rather indistinct; orifice subapical, lying in a semicircular notch in the posterior margin of the canal, about $\frac{2}{3}$ as far from the middle coxa as from the sternal margin. The form of the canal most nearly resembles that of the Brazilian *G. foratus* as figured by Signoret, but would seem to be less elevated above the metasternal evaporative area and more confused with the sternal suture

CORISCIDAE (Alydidæ olim.)

Protenor australis, new species.

Stramineous or pale testaceous, opaque, punctate with fuscous, the sides of the head and prothorax with a longitudinal vitta (interrupted by the eye) punctate with black, membrane infuscate, semi-transparent. Head (Fig. 1, A) $2\frac{1}{3}$ times as long as its basal width, one-half longer than the pronotum, with about one-fifth of its total length lying in front of the insertion of the labrum; frons commonly with a sharp median impression; antennæ situated very nearly at the middle of the head, red in color, the basal segment and the basal half of the second segment yellowish, spotted with fuscous, ratios of lengths of segments I: II: III: IV = 5: 6: 5: 9, the first three segments with rather closely set erect hairs, about as long as the thickness of the second segment, the pubescence of the fourth segment shorter, largely appressed. Rostrum almost reaching the posterior coxæ, the first segment barely reaching the base of the head. Pronotum commonly depressed across the middle, one-sixth longer than its width at base, densely and finely punctate, median subcallous line very narrow, percurrent. Pro-

thorax, as seen from the side, twice as long dorsally as it is ventrally. Femora more densely pilose than in *P. belfragei*, the hind femur reaching only to the base of the fifth ventral segment. The other characters are those of *P. belfragei*.

Length, 11–11½ mm.; humeral width, 1.3 mm.

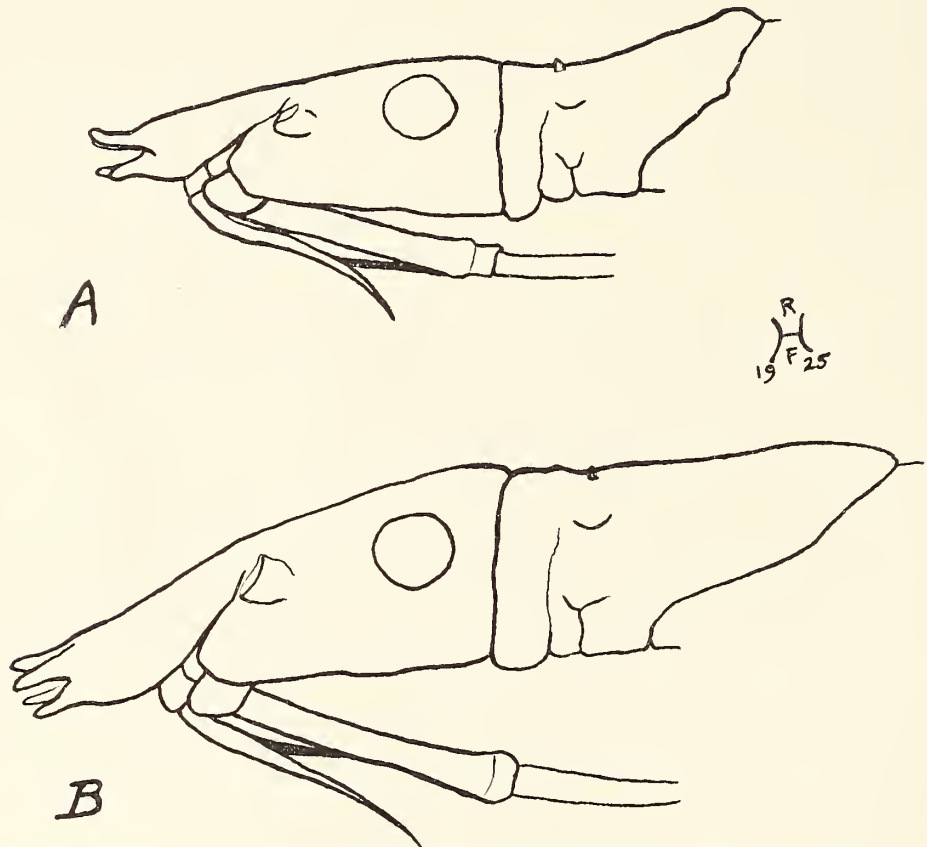
Holotype, ♀, Gainesville, Florida, Feb., 1924 (T. H. Hubbell), in my collection. Allotype, ♂, Fort Myers, Florida, 23. iv. 1912 (W. T. Davis), in Davis's collection. Paratypes: FLORIDA, Gainesville, ♂, ♀, 30. ix. 1914 (A. J. Mutchler), in American Mus. Nat. Hist.; GEORGIA, Thomasville, 16. iv. 1903, in Bueno's collection.

This species was reported from Florida under the name *Protenor belfragei* by Barber (1914, Bull. Amer. Mus. Nat. Hist., xxxiii, p. 521), on the basis of the Fort Myers specimen mentioned above. It is, however, very distinct from the northern species. It is considerably smaller, paler, not at all shining, the head is less produced in front of the rostrum, the femora are more pilose, the legs relatively shorter, and the antennae and the pronotum are differently constructed. In *belfragei* the head averages less than one-fourth longer than the pronotum and the pre-labral portion constitutes about one-fourth of its entire length; the prothorax, as seen from the side, is $2 \frac{1}{3}$ times as long dorsally as it is ventrally; and the ratios of lengths of antennal segments I:II:III:IV = 7:7:6:10. I can detect little difference in the male genitalia.

In the five specimens which I have seen of this species, the dorsal and the ventral apical processes of the jugæ are very strongly divergent from one another. While this character is somewhat variable in *P. belfragei*, as a rule these pairs of processes are porrect and contiguous throughout their length. The most widely divergent pair that I have seen are those on the specimen shown in Figure 1, B.

The origin of these processes appears to be indicated in a nymph of *P. australis*, apparently of the fifth instar, from Warburg Lake, Alachua County, Florida, 16. iv. 1924 (Hubbell). The jugæ of this individual are piceous, terete and subtruncately rounded at the apex, while from the dorsal and

from the ventral apical angle of each jugum a heavy cylindrical spine extends obliquely forward, the two spines diverging at an angle of almost 90° . The posterior pronotal angles of this nymph bear short blunt spines, directed upward and outward, while each connexival segment has a curved, strongly flattened, setose, spiniform process, situated on the margin behind the middle of the segment. These spines are much



A. Head and prothorax of *Protenor australis*, n. sp. B. Head and prothorax of *P. belfragei* Hagl., individual with unusually divergent jugal processes.

longer on the posterior segments; they are piceous along their anterior edges and whitish behind. Their exact nature can not be made out in this shrivelled specimen.

REDUVIIDÆ

Zelus (Pindus) angustatus, new species.

Elongate, narrow, covered with short white tomentum which is sparse above and dense on the under surface. Nearly uniform fusco-testaceous, somewhat paler on the disc of the pronotum; head dark fuscous; veins of the corium pale flavo-testaceous; membrane partially infusate, the veins

brown; antennæ and legs olive-brown, the fourth and fifth antennal segments, also the apical three-fourths of the third, paler. Head about as long as the pronotum, subcylindrical, very slightly and gradually narrowed toward the base; eyes small; interocular transverse sulcus lightly impressed; ocelliferous portion of the head very slightly elevated; white tomentum absent from the genæ and from a narrow median line on the dorsal surface; first antennal segment nearly three times as long as the head (14:5), $2\frac{1}{2}$ times as long as the second, and $1\frac{3}{4}$ times as long as the third segment. Pronotum one-fourth longer than wide, the posterior lobe one-half longer than the anterior; interlobular transverse sulcus and the median posterior impression of the anterior lobe much less deep than in *Z. socius*; spines of the posterior lobe short, blunt; discal carinæ scarcely discernable. Hemelytra scarcely attaining the apex of the abdomen. Legs unmarked.

Length, 14 mm.; humeral breadth, 2.1 mm.

FLORIDA, Gainesville, Dec., 1923 (T. H. Hubbell). Type, ♂, in my collection.

This species seems abundantly distinct from *Zelus socius* Uhler, which is a broader form with the head much more distinctly swollen behind the eyes, the interocular suture much more deeply impressed, the first antennal segment relatively shorter, the anterior lobe of the pronotum not concolorous with the posterior and with much deeper impressions, the legs banded with dark color at the apices of the femora, and the pronotal spines arising from small mammiform elevations (best seen from the side). In fresh specimens the abundant white tomentum also serves as a distinguishing character of *Z. angustatus*. This is probably the species which Van Duzee (1909, Bull. Buff. Soc. Nat. Sci., ix, p. 177) reported from Florida under the name *Pindus socius*.

VELIIDÆ

Rhagovelia choreutes, new species.

Color dull black or very dark gray, the dorsum with very short sparse yellow pile and with longer black hairs, the hairs longest on the pleura (especially in the male); basal third of first antennal segment, all the coxæ and trochantera, and the basal half of the fore and middle femora yellow; propleura, a large spot on either side of the median line at the anterior pronotal margin, and the outer one-half to one-third of the connexivum orange-yellow; apex of the frons plumbeous, shading into orange-yellow on the genæ. Occasionally one or both of the anterior pronotal spots may be pale yellow, pale gray, or even plumbeous.

Head $2\frac{1}{2}$ to $2\frac{3}{4}$ times as broad as long (in dorsal aspect), vertex somewhat more tumid and less flattened above than in *R. obesa*; width of an eye about $\frac{2}{3}$ as great as the posterior width of the vertex, or somewhat greater than its anterior width. First antennal segment about $\frac{7}{8}$ longer than the fourth. Pronotum rounded behind, entirely concealing the mesonotum, its length equal to its humeral width, distinctly but rather remotely punctate, the punctures most distinct on the posterior part. Propleura with a curving row of punctures arising behind the coxa and extending upward nearly parallel to the posterior margin; mesopleura with several punctures in front of the coxal cleft, and with a similar row of punctures paralleling the posterior margin. Odoriferous orifices located distinctly below the middle of the outer face of the posterior coxal cavities, with a tuft of six or eight long yellow setae (much longer and more distinct in the female than in the male), directed upward and outward, commonly more or less agglutinated to resemble a slender yellow spine. Anterior trochantera unarmed in either sex. Posterior femora with a long straight or slightly curved spine, at or slightly before the middle of the femur, followed by five or six smaller spines, diminishing in length toward the distal end of the femur; posterior tibiae minutely denticulate on the basal one-third or one-half of the posterior face. Intermediate tarsal segment III cleft for three-fourths of its length.

Male. Fusiform, more robust than the apterous males of *R. obesa*, the legs shorter and distinctly thicker. Antennal formula, segments I: II: III: IV = 35: 21: 19: 19. Legs, femur : tibia : tarsal segment II : tarsal segment III = (intermediate pair) 71: 53: 25: 35, (posterior pair) 54: 56: 7: 14. Posterior femora moderately incrassate, about one-half thicker than the intermediate femora at the base; long spine situated just before the middle of the femur. Genital segments together about one-third longer than the last dorsal abdominal segment.

Female. Quite similar in form to the apterous female of *R. obesa*, but the legs shorter and thicker, the connexivum differently formed, and the pronotum and the first abdominal segments otherwise constructed. Antennal formula, segments I: II: III: IV = 38: 22: 20: 20. Legs, femur : tibia : tarsal segment II : tarsal segment III = (intermediate pair) 72: 56: 28: 40, (posterior pair) 57: 65: 8: 16. Posterior femora not thicker than the intermediate femora at the base. Basal dorsal segments of the abdomen not tumid; first connexival segment without a tuft of hairs on the margin. Connexivum meeting above the last abdominal segment, occasionally above the last three segments, but not (as in *obesa*) meeting above the fourth segment, then diverging slightly to meet again above the sixth; apex obliquely truncate at an angle of about 45° , forming two short blunt spines, about as long as the width of the connexivum, not diverging posteriorly, pilose at their tips. Apex of the sixth abdominal segment with a tuft of long curved cilia on each side at the upper lateral angle of the first genital segment, and with several shorter cilia at each side below; the dorso-lateral

cilia may be more or less agglutinated, resembling a slender curved spine at either side of the genital segment.

Macropterous form. Unknown.

Length, 3.8 mm.; humeral width, 1.3 mm.

FLORIDA: Gainesville, 52 males and females, 13. x. 1923; 120 males and females, 9. iv. 1925, (T. H. Hubbell). Type (♂), allotype (♀), and paratypes in my collection; additional paratypes in the collections of H. G. Barber, J. R. de la Torre Bueno, C. J. Drake, H. B. Hungerford, H. M. Parshley, the Museums of the University of Michigan and the University of Florida, the United States National Museum, and the American Museum of Natural History.

This species agrees with *R. rivale* Bueno in the unarmed anterior trochantera of both sexes and the lack of a tuft of hairs on the first connexival segment of the female, but differs markedly from that species in the structure of the legs and in the fact that the connexivum of the female meets over the last dorsal segment. In Bueno's recent key to the nearctic species (1924, Trans. Amer. Ent. Soc. 50, pp. 244-246) it runs out to couplet 8, differing from the species which follow in the unarmed anterior trochantera of the male and the lack of the marginal tuft of hairs on the connexivum of the female, as well as in other characters, and differing from *R. Oriander* Parsh. in the structure of the pronotum, the much thicker and more abruptly swollen posterior femora, and in other respects. Bueno describes the connexivum of the female as meeting over the last dorsal segment in *R. Oriander*, but I have a female of this species (kindly given me by Professor Parshley) in which this character does not hold true.

A misleading statement appears in couplet 2 of Bueno's key (op. cit., p. 245). The second part of this couplet reads ". . . pronotum (in winged or apterous) acute or produced in a spiniform process behind;" This character holds true for the apterous form in *R. Oriander* alone.

NORTH AMERICAN SPECIES OF THE SUBGENUS SCOTOPHILELLA DUDA (DIPTERA, BORBORIDAE)*

BY ANTHONY SPULER

PULLMAN, WASHINGTON

Introduction

Scotophilella is the largest subgenus in the genus *Leptocera*. Species of this subgenus have a distinct apical bristle on middle tibia but lack the preapical bristle. Although these characters are very important many of the older descriptions do not state whether these bristles are present or not. Where the writer has not had access to type material the determination of some of these older species proved quite difficult.

Unless otherwise designated the types of the new species are placed in the A. L. Melander collection. This is one of a series of papers on the family Borboridæ.

Scotophilella Duda

Duda: Abhand. Zool.-Botan. Ges. Wien. X. I. 34 (1918).

Wings hyaline or browned, rarely distinctly pictured; cross-veins more widely separated; interfrontal bristles well developed; eyes large or small, if small the eyes are bare and never so small that they occupy less than half the height of head from vertex to vibrissal angle; antennæ more or less divergent, never opposed; second section of costa usually more than one-third as long as third; last section of third vein straight or but slightly curved up on last section; apical bristle on middle tibia, usually distinct.

Species of Scotophilella Duda

- | | |
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* Contribution from the Division of Entomology of the Washington Agricultural Experiment Station, State College of Washington.

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Genotype of
Limosina
may 1835
which are
Scotophilella
gma

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Leptocera (*Scotophilella*) **varicosta** Malloch.

Malloch: Trans. Am. Ent. Soc. 40 (1914).

Costa Rica.

The writer has three specimens from Mexico, Motzorongo, Vera Cruz (Osborn); Utuado, Porto Rico (Busck); and Plummers Isl. Md. (Schwarz) which agree quite well with Malloch's description of *L. varicosta* but have the cheeks a little more than half as high as long diameter of eye while Malloch's description reads "cheeks about as high as eye." Since they agree in all other respects they are undoubtedly *L. varicosta* Mall.

Leptocera (*Scotophilella*) **mirabilis** Collin. (Fig. 21.)

Collin: Ent. Mag. XIII. 59 (1902). (*Limosina*)

Knab and Malloch: Psyche. 19. 199 (1912). (*Limosina*)

Small subshining black species. Front more than two times as broad as deep, shining black; the divergent stripes and lower

front slightly reddish, opaque; interfrontal bristles in four pairs, the anterior pair reduced; ocellar tubercle present; ocelli distinct; antennæ divergent, the third joint browned, but little larger than the second, with whitish pubescence; artista a little less than three times antennal length, with long pubescence; face deeply concave in profile; carina well developed between the antennæ; anterior margin of epistome curved up; clypeus narrowly visible from in front; eyes rather small, occupying but little more than one-half of the height of the head from vertex to oral margin; cheeks one-half eye-height. Mesonotum with two pairs of dorsocentral bristles, the anterior pair indistinct; scutellum opaque, posterior margin rounded; disc bare; marginal bristles four. Wings hyaline; veins brown; costa ending at third vein, second and third sections nearly equal; penultimate section of fourth vein one and one-half times as long as outer crossvein and little shorter than the basal section of third vein; third vein straight on its last section, ending near wing-tip. Legs brown with coxæ, trochanters and tarsi yellow; hind tibæ armed with a long spur; hind metatarsi but little thickened, nearly as long as the next joint. Length 1-1.5 mm.

Described from a female specimen from Flathead Lake, Montana, collected by Melander, Aug. 19, 1916.

Fourteen specimens from Pullman, Wash., Goose Isl. Conn., Boston, Mass. (Melander), and Illinois (Ill. Univ.).

Leptocera (*Scotophilella*) **levifrons**, new species. Fig. 13).

Entirely black. Front broad, convex, with frontal triangle, upper portion of fronto-orbital stripes and interfrontal stripes shining; interfrontal bristles reduced, in four pairs, uniform in size, not cruciate; face slightly carinate, concave in profile; clypeus very narrowly visible from in front; carina between the antennæ well developed; cheeks slightly browned, at vibrissal angle, two-thirds as high as eye; buccæ with three irregularly arranged setæ; oral setæ weak; eyes small, but little more than half as high as head from vertex to mouth margin; antennæ divergent, moderate in size; third joint rounded, larger than second, arista two times antennal length, with short weak pubescence. Mesonotum with two pairs of dorsocentral bristles, the anterior pair considerably weaker than the posterior; acrostichal setulæ numerous, not arranged in regular rows; upper sternopleuræ with bristles setæ-like, the anterior weaker than the posterior; scutellum triangular, marginal bristles four, the anterior pair weaker than

the posterior. Abdomen short, one-half as long as the thorax, second segment as long as the next two. Legs with numerous short stiff hairs; middle femora with one anterior preapical seta; middle tibiae with three extensor bristles arranged as follows: one a little before middle and two at near apex; hind metatarsi two-thirds as long as next joint. Wings slightly smoky; costa black; other veins brown; costa ending considerably beyond third vein, all sections subequal, first section short ciliate; last section of second vein abruptly curved up at apex, ending beyond outer crossvein and two and one-fourth times as long as basal section of third vein; penultimate sections of third and fourth veins equal and two times outer crossvein; last section of third vein curved down at middle, ending near wing-tip, fourth vein traceable to wing-margin, discal cell rather long and narrow, outer angle long appendiculate. Length, 1.5 mm.

Type.—Male: Kendrick, Idaho, June 7, 1917 (Melander).

Paratypes.—Four specimens from the following localities: Washington: Lake Cushman, Ilwaco, Vashon and Union Flat (Melander).

Leptocera (*Scotophilella*) **gracilipennis**, new species. (Fig. 10).

Opaque piceous. Front two times as broad as deep, with the frontal triangle, the orbital stripes and the narrow interfrontal stripes fuscous, slightly shining; lower front distinctly ridged in the middle; interfrontal bristles reduced, in four uniform pairs, not cruciate; fronto-orbital bristles directed outward, the lower weaker than the upper; orbital setulae weak, not extending above the upper fronto-orbital bristle; ocelli prominent; antennae divergent, not widely separated; arista three times antennal length, with dense pubescence; face and cheeks fuscous; face deeply concave in profile, marked with two horizontal black bands, one just below carina and one on anterior margin; carina developed between the antennae only; clypeus narrowly visible from in front; eyes rather small, occupying but little more than half the height of the head from vertex to mouth margin; facets distinct; cheeks, from vibrissal angle to lower margin of eye, three-fourths as high as eye; buccal setae three in number, upcurved, the anterior seta bristle-like and much stronger than the other two; oral setulae distinct. Mesonotum broad; dorsocentral bristles in two pairs, the anterior pair very weak; acrostichal setulae short, arranged in eight rows between the anterior pair of dorsocentral bristles; posthumeral bristle absent; scutellum quadrangular, disc bare; marginal bristles four, the anterior pair much weaker than the posterior; pleurae dark fuscous with sutures yellow. Abdomen short, two-thirds as long as thorax; second segment very much elongated, as long as the next three. Legs pale brown with coxae and trochanters yellowish; middle femora with a single anterior preapical setae; middle tibiae with three extensor bristles one on basal third, and two on apical third; hind metatarsi thickened, two-thirds

as long as the second joint. Wings narrowed apically, whitish; costa black, other veins pale brown to yellow; costa produced beyond third vein, first section short ciliate, equal to third and three-fourths as long as second; basal section of third vein a little less than one-third as long as the last section of second vein, two-thirds as long as the distance between crossveins and two times outer crossvein; last section of third vein straight, ending near wing-tip; fifth vein ending abruptly a short distance from outer crossvein. Halteres with a yellow stem and pale brown knob. Length, 1.5–1.75 mm.

Type.—Male: Friday Harbor, Wash. (Melander).

Paratypes.—Four specimens from the following localities: Idaho: Moscow (Melander). Illinois: (Ill. Univ.). Massachusetts: Boston (Melander).

Leptocera (*Scotophilella*) **cellularis**, new species. (Fig. 12).

Opaque black. Front convex, almost twice as deep with the setigerous stripes and frontal triangle shining; divergent stripes velvety black; bristles of vertex and occiput rather weak; fronto-orbital bristles weak, divergent, the lower two-thirds as long as upper; orbital setulæ numerous, minute, hair-like, extending above upper fronto-orbital bristle; interfrontal bristles in four pairs, nearly uniform in size, not cruciate; interfrontal setulæ in one pair, directly below anterior pair of interfrontal bristles; face fuscous, carinate, concave in profile, lower margin of epistome prominently curved upward; clypeus narrowly visible from in front; eyes rather small, occupying but little more than half the distance from mouth margin to vertex; cheeks, at vibrissal angle, half as high as eye, fuscous; buccæ with an up-curved bristle and numerous weak irregular setulæ; oral setulæ weak; antennæ fuscous; third joint quadrangular, much larger than second, with minute whitish pubescence; arista two and one-fourth times antennal length with long pubescence. Mesonotum broad; dorsocentral bristles in one pair; acrostichal setulæ numerous, rather long, not arranged in definite rows; posthumeral bristle absent; scutellum quadrangular, disc bare; marginal bristles four, the basal pair two-thirds as long as apical; pleural sutures pale brown, sternopleuræ fuscous, with a posterior bristle and two anterior setulæ. Legs fuscous; middle femora with a single anterior pre-apical seta, middle tibiæ with two flexor, one at middle and one at apex, and three extensor bristles, one before apex and two on apical third; hind tibiæ without macrochaetæ; hind metatarsi two-thirds as long as second joint. Wings hyaline; costa black, other veins brown; costa ending a little beyond third vein, second section one and one-third times third, basal section of third vein one-third as long as last section of second vein, shorter than penultimate section of fourth vein and one and two-thirds times outer crossvein; last section of third vein straight, ending

near wing-tip; discal cell long, short appendiculate. Abdomen short, cylindrical hairy; second segment two times third; hypopygium large. Length: 1.75 mm.

Type.—Male: Austin, Texas (Melander).

Paratypes.—Two specimens from the same collection.

Leptocera (*Scotophilella*) **venalicia** Osten Sacken. (Fig. 6).

Osten Sacken: Cat. N. Am. Dipt. 263 (*Borborus*).

Williston: Tran. Ent. Soc. Lond. 434 (1896). (*Borborus*).

Coquillett: Proc. U. S. N. M. XXII. 269 (1900). (*Limosina*).

Adams: Kans. Univ. Sci. Bull. III. (1905). (*Limosina*).

Eleven specimens from the following localities: Cuba: Havana (Baker). Haiti. Hawaii (Bryant). San Domingo (Johnson).

Leptocera (*Scotophilella*) **maculipennis**, new species. (Fig. 24).

Black subshining. Front convex, almost twice as broad as long, slightly gray dusted, with the divergent stripes, divided by the interfrontal stripes, forming a distinct velvety black M-shaped mark; extreme lower front reddish; bristles of head well developed; fronto-orbital bristles directed outward over eye and backward, the upper, one and one-half times as long as the lower; orbital setulæ weak; interfrontal bristles in three pairs, the anterior pair cruciate; one pair interfrontal setulæ present; cheeks and face gray pollinose; cheeks, from lower margin of eye to oral margin, one-third as high as eye; face deeply concave in profile; clypeus narrowly visible from in front; vibrissæ strong; oral setulæ strong; buccal setulæ increasing in size toward vibrissal angle, the last two pairs curved up and stronger than the others; third joint of antennæ oval; arista two and one-half times antennal length, short dense pubescent. Mesonotum short, broad, tapering posteriorly, convex; dorsocentral bristles in two pairs, the posterior pair slightly longer than the other; acrostichal setulæ in eight to ten irregular rows between anterior pair of dorsocentral bristles; posterior pair of middle acrostichals longer than the others; posthumeral bristles absent; scutellum triangular, margin with four long bristles and two basal setæ, the posterior pair of bristles almost twice as long as the others; pleural sutures brown to yellow, upper sternopleuræ with a single strong bristle. Legs fuscous, with coxa, trochanters, bases and apices of tibiæ and tarsi lighter; middle femora with a row of setæ on the anterior apical half, increasing in size toward apex, the last three becoming bristle-like; middle tibiæ with two flexor, one a little beyond middle and one at apex, and four extensor bristles, two at basal third and two strong, near apex; hind metatarsi two-thirds as long as second joint. Wings hyaline with brownish areas on the tips of the first, second and third veins and

at outer cross-vein; veins brown; costa black towards base, ending at third vein, first section setulose, equal to the second and one and one-fourth times third; basal section of third vein two-fifths as long as last section of second vein; basal section of third vein one and two-thirds times as long as the distance between crossveins and two times outer crossvein; last section of third vein curved up and ending considerably before wing-tip; fourth vein barely traceable on its last section; discal cell short appendiculate. Abdomen short, cylindrical; hypopygium large; second segment two times third. Halteres yellow. Length, 1-1.5 mm.

Type.—Male: Friday Harbor, Wash. (Melander).

Paratypes.—Four specimens from the following localities: Washington: Mt. Constitution (Melander). British Columbia: Lorvis Inlet (Kincaid). Alaska: Popoff Isl. (Kincaid).

Leptocera (*Scotophilella*) **robusta**, new species. (Fig. 9).

Subshining black. Front almost twice as broad as high, silvery pollinose on the orbital and interfrontal stripes and on the ocellar tubercle; frontal triangle and divergent stripes brownish black; interfrontal bristles in four pairs, the anterior two pairs long and cruciate; orbital setulae minute, not extending above the upper fronto-orbital bristle; ocelli reddish; antennae with third joint slightly larger than second, covered with whitish pubescence; arista two and one-half times as long as antennae; face black, distinctly carinate, slightly concave in profile; eyes large; cheeks browned, one-fourth as high as eye when measured at vibrissal angle; oral vibrissae very strong; buccal bristles strong. Mesonotum with two pairs of dorso-central bristles, the posterior pair much stronger than the anterior; acrostichal setulae numerous, irregularly arranged; posterior pair of acrostichal bristles well developed; scutellum truncate, disc velvety black, margined with four strong bristles; pleurae velvety black, sutures yellowish; posterior sternopleurae bristle well developed, much longer than the anterior bristle. Legs black with tibiae and tarsi brownish; front femora slightly incrassate with a row of hair-like bristles on both extensor and flexor surfaces; middle femora with a row of hair-like bristles and a stiff pre-apical bristle on anterior surface; middle tibiae with extensor bristle well developed, apical bristle present; hind tibiae long hairy; hind metatarsi half as long as following joint. Abdomen flat, oval, shorter than the thorax; second segment one and one-half times third. Halteres black. Wings as in Fig. 9. Length, 3 mm.

Type.—Female: La Suiza de Turrialba, Costa Rica, (Pablo Schild).

Paratype.—Female from same collection.

Leptocera (*Scotophilella*) **Xanthocephala**, new species. (Fig. 18).

Head entirely yellow; legs yellow with apex of front femora and front tibiae black. Notum and abdomen shining black. Front flat, broader than high, uniformly yellow, ocellar area slightly browned; interfrontal bristles minute, in three pairs; orbital bristles distinct; antennae divergent, not directed outward, third joint distinctly pubescent; arista two and one-half times antennal length, with long pubescence; face distinctly concave, mouth-margin curved up; cheeks narrow, one-sixth as high as long diameter of eye; eyes large. Mesonotum slightly convex; dorsocentral bristles weak, in two pairs; acrostichal setulae minute; scutellum short triangular, marginal bristles four. Front femora swollen, with a row of hair-like bristles beneath; middle tibiae with the extensor bristles rather weak but with a distinct apical bristle; hind femora with a distinct pre-apical bristle above; extensor surface of hind tibiae with some hair-like bristles and with a long bristle near apex; first and second joint of hind tarsi thickened; hind metatarsi two-thirds as long as second joint. Wings slightly browned, venation as in Figure 18. Abdomen cylindrical; hypopygium small. Length, 1.5 mm.

Type.—Male: La Suiza de Turrialba, Costa Rica (Pablo Schild).

Allotype.—Female from the same collection.

This species comes close to *palliceps* Johnson. According to Johnson's description of *palliceps*, the antennae are brown and the middle and posterior femora black. In the species just described the antennae and the middle and posterior femora are yellow. The brief description given by Johnson makes it rather difficult to place the species with certainty. As far as the writer can determine, the two species are quite distinct.

Leptocera (*Scotophilella*) **palliceps** Johnson.

Johnson: Psyche Vol. XXII. 22 (1915). (*Limosina*).
Clermont, N. J.

Leptocera (*Scotophilella*) **inconspicua** Malloch.

Malloch: Tran. Am. Ent. Soc. 40, 16 (1914).
Costa Rica.

Leptocera (*Scotophilella*) **parva** Malloch.

Malloch: Proc. U. S. N. M. 44. 371 (1913). (*Limosina*).
Malloch describes this species from Washington, D. C.
Seven specimens from Kalso, B. C., and Illinois (Melander).

Leptocera (*Scotophilella*) **concava**, new species. (Fig. 20.)

Shining black. Front slightly convex, two-thirds as deep as broad, opaque, gray pollinose; lower front with narrow margin reddish; fronto-orbital bristles widely divergent, the lower only half as long as upper; orbital setulæ weak, not extending above upper fronto-orbital bristle; interfrontal bristles in three pairs, the upper and lower pair very weak, the middle pair long and cruciate; interfrontal setulæ microscopic; face brown, carinate between antennæ, deeply concave near mouth margin, lower portion yellowish; clypeus narrowly visible from in front; cheek two-fifths as high as eye; buccal bristles absent; oral setulæ weak; antennæ with third joint reddish; arista three times antennal length, short pubescent. Mesonotum short and broad, glossy black; dorsocentral bristles in two pairs, the posterior pair more than twice as long as anterior; discal setulæ in six rows between anterior pair of dorsocentral bristles; scutellum quadrangular; marginal bristles four; sternopleuræ with a posterior bristle and anterior seta. Legs with front coxa, bases and apices of femora and tibiæ and tarsi yellowish; front coxa reddish; middle femora with three anterior preapical bristles; middle tibiæ with six extensor, one before middle and three small and two large on apical third; hind metatarsi one-half as long as second joint. Wings slightly browned, veins brown; costa produced to wing-tip and beyond third vein, first section setulose, equal to second, second heavy, darker, two-thirds as long as third; last section of second vein, concave on posterior side, two and one-half times as long as basal section of third vein; distance between crossveins, two times outer crossvein and one and one-fourth times basal section of third vein; third vein slightly curved up on its last section, ending considerably before wing-tip; fourth vein not reaching wing-tip; discal cell long appendiculate. Abdomen glossy black, very long and broad; segments subequal or nearly so. Halteres black with yellow stem. Length, 2.5 mm.

Type.—Female, Stanford U. Calif. Jan. 28, 1906.

Paratypes.—Eleven specimens distributed as follows: Washington: Pullman (Melander). California: Stanford U. (Melander): Redwood Canon (Cresson): Eureka (Barber): Santa Cruz, Alameda (Coquillett).

Leptocera (*Scotophilella*) **perparvi** Williston.

Williston: Tran. Ent. Soc. Lond. 433. Pl. XIV. (1896) (*Limosina*).

Described from St. Vincent, W. I.

Leptocera (*Scotophilella*) **pallicornis** Malloch.

Malloch: Tran. Am. Ent. Soc. 40, 15 (1914).
Costa Rica.

Leptocera (*Scotophilella*) **nasuta**, new species. (Fig. 23.)

Opaque black. Front convex, longer than broad, setigerous stripes and ocellar triangle slightly gray dusted; divergent stripes velvety black; bristles of head reduced; interfrontal bristles in five pairs, uniform in size; fronto-orbital bristles divergent, directed outward, the lower slightly weaker than the upper; orbital setulæ present, minute, not extending above the upper fronto-orbital bristle; antennæ divergent; third joint but little longer than second, with whitish pubescence; arista two times antennal length, its pubescence short and dense; face carinate, concave in profile, gray pollinose; clypeus narrowly visible from in front; cheek, from lower margin of eye to mouth margin, half as high as eye; buccal setulæ hair-like, two in number, the anterior pair longer, upcurved; oral setulæ few. Mesonotum short and broad, disc convex; acrostichal setulæ numerous, arranged in eight rows between the anterior pair of dorsocentral bristles; dorsocentral bristles in one pair; sternopleuræ with a single anterior hair-like bristle; scutellum triangular; marginal bristles four, the anterior pair much weaker than the other. Legs short, hairy; middle femora with a single preapical anterior seta; middle tibiæ with the usual flexor and extensor bristles; hind metatarsi incrassate, three-fourths as long as second joint. Wings brown; veins fuscous; marginal cell broad; costa produced beyond third vein, first section equal to second and three-fourths as long as third; last section of third vein with a gentle curve like letter S; penultimate section of fourth vein slightly longer than penultimate section of third vein and one and one-half times outer crossvein; fourth vein traceable to wing-margin; outer angle of discal cell rounded. Abdomen broad, in female, cylindrical in male, almost bare; second segment elongated, equal to the next two. Halteres fuscous. Length, 1.25 mm.

Type.—Male: Pullman, Wash. May 19, 1912 (Melander).

Paratypes.—Four specimens from: Washington: Lake Whatcom, Pullman and Almota (Melander). Idaho: Potlatch (Melander).

(To be continued)

A NEW GENUS AND SPECIES OF TROMBIDIIDAE—(Acarina)

BY PHILIP GARMAN

During the summer of 1920, a single female Trombidiid was collected from the roots of grass. This specimen has proved so unusual in form that it is described herewith, although only one specimen is at hand. It is a close relative of *Tanaupodus* Haller, but no representative of this genus has been found in the United States. In structural features, the dorsal groove is greatly different and necessitates the erection of a new genus.*

Neotanaupodus, new genus.

Dorsal groove Y-shaped, sensory setæ at the ends of the arms; abdomen suboval, the shoulders or humeral angles fairly prominent; surface of abdomen and legs tuberculate and reticulate; body setæ simple, placed on small tubercles between numerous chitinous plates, which are arranged in rows; palpal thumb long and slender, provided with long slender setæ; segment 4 of palpus also with long slender setæ and 4 to 5 heavy spines at base of terminal claws.

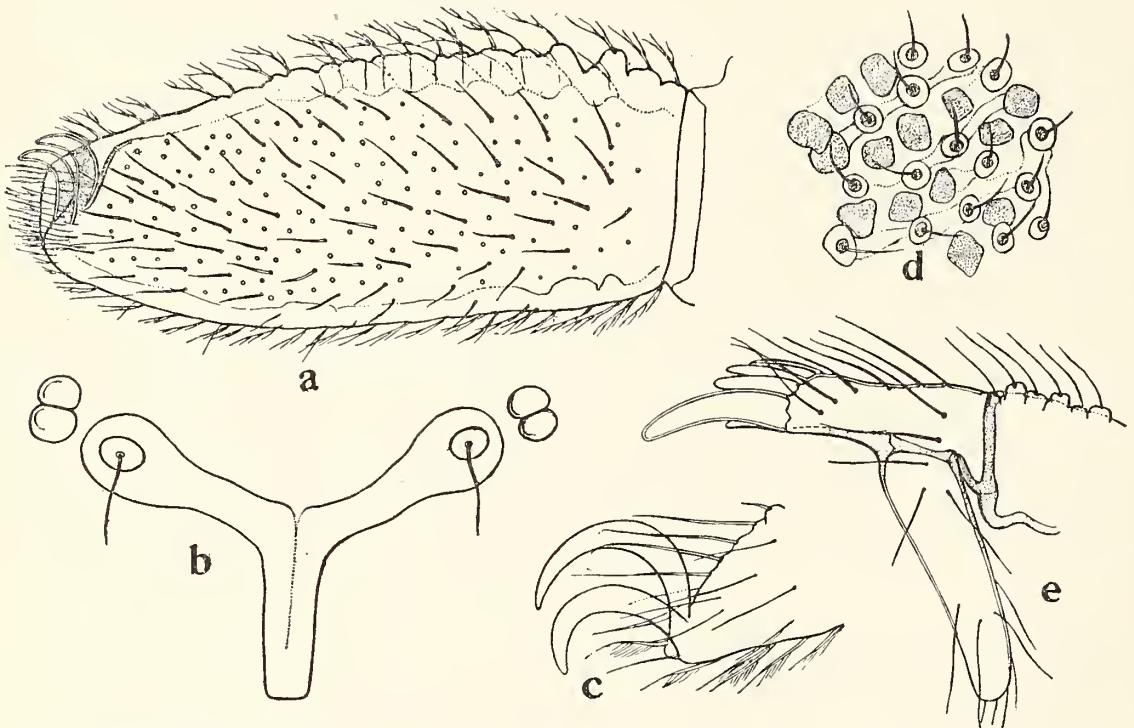
Neotanaupodus tuberculatus, new species.

Adult; female.—Palpal thumb long and slender with a number of setæ; distal segment slender with strong terminal hook, 4 spines and a number of long slender setæ; middle segments provided with conspicuous tubercles, each bearing a curved spine-like simple seta; legs also with numerous setæ bearing tubercles, the tarsal segment also bearing setæ, interspersed with non-seta bearing tubercles; many of the setæ appear to be provided with minute additional hairs (thinly plumose), especially on the dorsal and ventral surfaces; tarsal claws without pulvillus; length of tarsal segment I from base of claws to caudo-dorsal point of articulation with the proximal segment .19 mm.; greatest width .08 mm.; claws of hind legs large, sickle shaped; coxæ of first two pairs approximate, separated from the last two which are also approximate.

* Thanks are due to Dr. H. E. Ewing, of the U. S. National Museum, who has kindly examined the specimen described and confirmed the author's ideas regarding its position and identity.

Cephalothorax much narrower than the abdomen, the dorsum provided with chitinous plates between which are simple setæ; dorsal groove Y-shaped, each anterior arm rounded at the end and provided with a single simple seta.

Abdomen with numerous chitinous plates which are somewhat rhomboidal in shape but with rounded corners and with simple setæ between; chitinous plates arranged in rows and radiating from an indefinite central area where they seem to be confused or irregular in arrangement; plates on venter of abdomen placed irregularly and not in rows; genital opening large, about twice as long as the anal opening, which is about .10 mm. long.



N. tuberculatus. a, Tarsus and claws of first pair of legs. b, Dorsal groove and eyes. c, Tarsal claws of leg IV. d, Portion of the dorsum of the abdomen. e, Terminal portion of palpus.

Measurements

Total length, 1.14 mm.; width of abdomen at shoulders, .64 mm.; length of hind tarsi, .19 mm.; diameter of chitinous plates of dorsum, .01 to .02 mm.

Habitat: New Haven, Conn., from roots of grass.

Date of collection, July 12, 1920.

Type in collection of Connecticut Agricultural Experiment Station.

NOTES ON THE RHYNCHOPHORA OF EASTERN NORTH AMERICA WITH DESCRIPTIONS OF NEW SPECIES, III

BY W. S. BLATCHLEY

INDIANAPOLIS, INDIANA

This is the third¹ of a series of articles supplementary to the "Rhynchophora of Northeastern America" which was issued by Chas. W. Leng and myself in 1916. In them I make brief mention of new species since described by others from the territory covered by the Rhynchophora; also of species considered extralimital at the time that work was published, but which have since been taken within that territory. As our knowledge of the habits and distribution of these injurious weevils is constantly increasing, I include brief notes on new information of importance concerning those points discovered by others or myself from time to time.

Since the second of these supplementary papers appeared in 1922, I have collected extensively in southern Florida, especially around Lake Okeechobee, Miami and Royal Palm Park, and have taken a number of subtropical forms not before known from that region. Some of these are herein described as new species. Numerous specimens have also been received for naming which has added much to our knowledge of the distribution of certain forms.

The numbers before the majority of the species mentioned are the serial numbers of the same species in the Rhynchophora. Where no number is given the species was not included in that work. The nomenclature, where different from that of the Rhynchophora, is that of Leng's "Catalogue of the Coleoptera of America North of Mexico."

¹ The other two were published in this Journal, Vol. XXVIII, 1920, pp. 161-178, and Vol. XXX, 1922, pp. 95-106, 113-127.

7. *Toxotropis pusillus* Lec.

Since the "Rhynchophora" was issued this species has been taken at Dunedin, Cape Sable and Key West, Florida. About Dunedin it is frequently swept in late autumn and early spring from tall grasses and other herbage growing along the margins of ponds.

11. *Toxotropis floridanus* Leng.

This prettily marked little anthribid apparently occurs only on ferns and low herbage in dense hammocks. It is distributed throughout the southern half of Florida, having been recently taken at Lake Wales, on Kramer's Island in Lake Okeechobee and at Royal Palm Park. In some specimens the two large, dark spots, one on apical third of each elytron, are connected by a narrow dark bar across the suture.

12. *Eusphyrus walshi* Lec.

Specimens are now at hand from Dunedin, Lake Wales and Istokpoga, Florida and Marion County, Indiana. The adults usually occur on foliage of shrubs in the vicinity of water, and it has been reared by Champlain and Knull from dead twigs of sumac, black locust and hickory.

13. *Gonotropis gibbosus* Lec.

Champlain and Knull have recorded² this species as occurring on dead hemlock branches during successive years. No food plant was given in the Rhynchophora.

20. *Piezocorynus mixtus* Lec.

Sixteen examples of this species were taken July 8, 1923, from the bole of a dead beech near Broad Ripple, Marion County, Indiana. They were in crannies and little holes in the bark and jumped vigorously when disturbed.

24. *Toxonotus fascicularis* (Schön.).

New stations for the species are Everglade and Royal Palm Park, Florida. At the latter place it was found March 15 beneath bark of a dead Caribbean pine.

² Can. Ent., 1923, 115.

34. *Araecerus fasciculatus* (DeG.).

Found in recent years in some numbers at Dunedin and Lakeland, Florida, and sent to me for naming from Volusia County, that State. About Dunedin it has been taken in April from the seed pods of the Spanish bayonet, and by sweeping low shrubs. Those sent in were said to have been damaging blackberries.

69. *Apion anceps* Fall.

Several specimens were taken August 4 by sweeping along old roadways on high wooded ridges in Crawford County, Indiana. Known heretofore only from the unique Illinois type.

81. *Apion perminutum* Smith.

Taken in numbers in March at Royal Palm Park, Florida, by sweeping herbage on the border of a slough in the everglades.

83. *Apion tenuiforme* Fall.

Several examples have been taken in January at Dunedin, Florida, from the bark of dead pine.

85. *Apion coxale* Fall.

This species is at hand from Knoxville, Tennessee, and Montclair, Irvington and Berkely Heights, New Jersey.

90. *Apion gulare* Fall.

Taken at Lakeland, Caxambus and Miami, Florida, by beating dead limbs and bunches of Spanish moss. Known heretofore only from Key West and Biscayne Bay, that State.

92. *Apion walshi* Smith.

At hand from Porter County, Indiana, Framingham, Massachusetts, and Jamesburgh, New Jersey.

—. *Apion delta* Buchanan, Proc. Ent. Soc. Wash., 1922, 83.

Described from Virginia and North and South Carolina. An oblong, rather robust, black species, 2 mm. in length, with sparse

pubescence of hair-like scales and reddish legs. Belongs under cc of Group IV, p. 83 of the Rhynchophora.

113. *Apion parallelum* Smith.

Several specimens were taken August 4 by sweeping low herbage on the slopes of wooded hills in Crawford County, Indiana. The first record for that State.

— ***Tachygonus minutus* Blatch.**

Three additional specimens of this little weevil have been taken at Dunedin since it was described³ from a unique. It occurs in April on limbs of recently felled pine or in dense hammocks.

128. *Hormorus undulatus* (Uhler).

The adults of this handsome otiorhynchid have been recorded⁴ by Britton as feeding on the leaves of lily of the valley and by Champplain and Knull⁵ as attacking Solomon's seal and false Solomon's seal, the adults feeding on the leaves, the larvae "working externally on the tubers, chewing out large sections in their feeding operations." No food plant was mentioned in the Rhynchophora, the Britton record having been overlooked by us.

151. *Pachnaeus litus* (Germar).

152. *Pachnaeus opalus* (Oliv.).

Schwarz and Barber have recently shown⁶ that the names of these two species as determined by Horn⁷ and as used by Blatchley and Leng in the Rhynchophora, are wrong and that they should bear respectively the names given above. They state that Horn applied the old specific name, *opalus* (Oliv.), to the wrong species, and described the old species as new. The form with

³ Can. Ent., LII, 1922, 63.

⁴ Report Conn. Agr. Exp. Sta., 1905, 259.

⁵ Ent. News, XXXII, 1921, 270, and Can. Ent., LIV, 1922, 103.

⁶ Proc. Ent. Soc. Wash., 1922, 29.

⁷ Proc. Amer. Phil. Soc., XV, 1876, 82.

base of thorax strongly bisinuate, which occurs only in south Florida and Cuba, was described by Germar from Cuba in 1825 as *Cyphus litus*; while the more common one with thoracic base feebly bisinuate, which ranges from New Jersey southward, is the *P. opalus* (Oliv.), 1807, the *P. distans* Horn (1876) being a synonym.

156. *Pandeleteius subtropicus* Fall.

Three specimens were taken March 11, while beating along pathways in Brickell Hammock, just south of Miami, Florida. Known heretofore only from Key West.

157. *Compsus auricephalus* (Say).

A specimen taken at Olive Branch, southwestern Illinois, was received from C. A. Frost for naming. Not before recorded north of Mississippi.

—. *Polydrusus decoratus* Woodruff, Journ. N. Y. Ent. Soc., XXXI, 1923, 155.

Described from Hazen, Alabama, where sixty specimens were taken on sugar maple and chestnut oak. Smaller than *P. americanus* Gyll. (3.1–3.7 mm.), with brown scales of dorsal patch much paler, without white scales about the scutellum and beak shorter and much less constricted.

170. *Polydrusus sericeus* Schall.

Examples of this species, taken near Wooster, Ohio, have been sent me for naming.

177. *Eudiagogus rosenschoeldi* Fahr.

The first specimens known from Florida were recently sent to me for naming by Prof. J. R. Watson, of Gainesville. They were taken at Tampa on oak.

191. *Phytonomus nigrirostris* (Fab.).

Within recent years this weevil has become quite common in Marion County, Indiana, occurring on foliage of herbs along

streams and in moist woods. Only a single specimen had been taken in the State prior to 1916.

206. *Listronotus appendiculatus* (Boh.).

New records for this species are Marion County, Indiana, June and October; Moore Haven, Florida, March 27. Not before known from Florida and in Indiana only from Lake County in the extreme north of the State.

214. *Listronotus debilis* Blatch.

This species has been taken in some numbers in Marion County, Indiana, by sweeping low vegetation growing in alluvial woodland along the banks of White River.

— ***Desiantha nociva* Lea.**

This species, known as the "Australian tomato weevil," has recently gained a foothold in southern Mississippi, where it occurs over an area of 700 or more square miles.⁸ It was originally described from Australia, belongs to the Tribe Hyperini and is about 8 mm. long, dull grayish-brown in hue, clothed with buff and gray scales and with a V-shaped grayish mark on apical third of elytra. It hibernates as imago and both larvæ and adults attack the above-ground portions of tomato, potato, turnip and other plants.

—— ***Hyperodes annulipes*, new species.**

Oblong-oval. Dark chestnut-brown, above thickly clothed with a dense crust of grayish-brown scales, those of beak and head with a metallic yellow tinge; antennæ and tarsi reddish-brown; femora with a broad ring of grayish scales just behind the middle. Beak slender, subcylindrical, three-fourths the length of thorax, finely and densely punctate and with five fine carinæ, the median one scarcely more evident than the others. Funicle with first and second joints subclavate, the second more than one-half longer than first, 3-7 submoniliform; scape slender, reaching eyes, its groove deep, narrow, well defined, directed toward their upper margin. Thorax relatively short, subcylindrical, about as wide as long, sides broadly rounded; disk densely and finely punctate, each puncture closed by a rounded convex scale; postocular lobes narrow, in repose covering half the eyes. Elytra one-half

⁸ See Chittenden, Circ. No. 282, U. S. Dept. Ent., July, 1923.

wider at base than thorax, humeri narrowly rounded; sides straight and feebly converging to apical third, thence more strongly so to the narrowly rounded apex; disk with sculpture hidden by the dense crust, intervals each with a row of short, stout inclined bristles. Under surface coarsely and closely punctate, the third and fourth ventrals more sparsely so. Length, 3.8-4 mm.

Described from two specimens taken March 26 at Dunedin, Florida, from a mass of decaying stems of pickerel weed. Belongs under *aa* of Group I, p. 166, of the Rhynchophora, but smaller than *cryptops* with beak much narrower and thoracic punctures much smaller. The disk of thorax appears granulate as in *H. sparsus* Say, due to the convex scales covering the punctures.

217. *Hyperodes cryptops* (Dietz).

New Florida stations for this species are La Belle, Moore Haven, and Royal Palm Park. It occurs in some abundance in March and April, but only about the margins of ponds and sloughs either on the flowers and foliage of pickerel-weed and arrow-head, or in muck near these plants.

226. *Hyperodes subcibratus* (Dietz).

This appears to be a scarce submarine species. But three specimens have been taken, two of which were sifted on April 9 from weed debris along the bay front at Dunedin.

— ***Hyperodes latinasus* Blatch.**

A single example of this species, heretofore known only from Fort Myers, Florida, was taken at Royal Palm Park while sifting decaying leaves in moist ground.

233. *Hyperodes mirabilis* (Dietz).

Three examples of this species, hitherto known from a unique Illinois type, are at hand from Lake and Marion counties, Indiana. They were taken singly by sweeping along the margins of sloughs in April, June and August.

250. *Pachylobius picivorus* (Germ.).

A specimen of this well known weevil, taken at Yarboro, Texas, was received for naming. It has not before been recorded west of Arkansas and Florida.

—. *Cholus cattleyae* Champ., Entom. Mo. Mag., 1916, 201.

This tropical Colombian orchid weevil has been introduced into greenhouses in Wisconsin, New Jersey and the District of Columbia. It is a robust, coarsely sculptured black species, 9–12 mm. in length, with white scales forming an irregular pattern on the elytra and clothing densely most of the under surface. The weevil attacks the pseudo-bulbs and leaves of the *Cattleya* and other orchids. A closely allied species, *C. forbesii* Pascoe, has also been taken in New Jersey greenhouses.⁹

253. *Heilipus squamosus* (Lec.).

My first capture of this large Hyperid was made April 10, 1923, while beating foliage of sassafras in Skinner's Hammock, northeast of Dunedin, Florida. The only other recorded Florida station is Enterprise.

—. *Dorytomus frosti* Blatch.

The second known specimen of this species, taken at Canaan, Connecticut, was recently recorded¹⁰ by Frost.

273. *Notaris aethiops* (Fab.).

Examples of this species have been received from Edmonton, Alberta, thus extending northwestward the range as given in the Rhynchophora.

—. *Notaris bimaculatus* (Fabr.).

This European species, of which the *N. wyomingensis* Chitt. is a synonym, has been recently recorded¹¹ from Madeline Island

⁹ For an account of this and other greenhouse orchid weevils see Weiss, Ent. News, XXVIII, 1917, 26–28, and Barber, Proc. Ent. Soc. Wash., XIX, 1917, 12.

¹⁰ Bull. Brook. Ent. Soc., 1924, 37.

¹¹ Buchanan, Ent. News, 1923, 280.

and Madison, Wisconsin. Its known range in this country extends from Iowa and Wisconsin northwest to Wyoming and Ft. Resolution, Mackenzie.

280. *Desmoris pervisus* Dietz.

Examples of this species, taken at Avon, New Jersey, August 30, were received for naming from C. A. Frost. Not before recorded east of Illinois.

306. *Smicronyx nebulosus* Dietz.

This has proven to be a rather common species in Marion County, Indiana, occurring on low herbage in dense woodland in August and September.

321. *Anchodemus angustus* Lec.

This species has recently been taken in small numbers from arrow-head and pickerel weed at Dunedin and Royal Palm Park, Florida, and probably occurs throughout that State.

327. *Bagous magister* Lec.

A single specimen of this, our largest *Bagous*, was sifted March 28 from grass roots taken from the sides of a ditch near Dunedin, Florida. This is the first record for that State.

——. ***Bagous carinatus*, new species.**

Oblong-oval, robust for the genus. Piceous-black; head, beak, thorax, femora, tibiae and under surface densely clothed with a crust of fine clay-yellow scales; elytra similarly and evenly clothed with fuscous-black scales and with a whitish bar, reaching fifth interval on each side, across the suture in front of declivity; antennae and tarsi reddish-brown. Beak shorter than thorax, stout, subcylindrical. Thorax slightly wider than long, sides swollen in front of middle, disk uneven, rather strongly constricted near apex and with a fine median carina reaching from constriction to base. Elytra one-half wider at base than thorax; humeri obliquely subtruncate; sides straight and very slightly converging to apical fifth, thence more strongly so to the narrowly rounded tips; disk with intervals 3, 5 and 7 slightly wider than the others and distinctly elevated throughout their length, the fifth ending in a prominent tubercle at upper edge of declivity, the seventh swollen in front on humeri. Length, 3.5–4.2 mm.

Described from a pair of individuals taken March 1 from beneath a chunk on the side of the canal at Moore Haven, Florida. Belongs under *a* of Group I, p. 231, of the Rhynchophora, but the disk of pronotum, while uneven, is without the distinct short ridges of either *magister* or *cavifrons* and with a median carina not found in either of those species. The male is also distinctly smaller than in either.

340. *Bagous obliquus* Lec.

The first definitely known Indiana specimens of this widely distributed species were taken in Marion County on May 30, 1922. They were swept from low herbage along the side of a pond.

363. *Otidocephalus myrmex* (Hbst.).

Champlain and Knull have recorded¹² the occurrence of the larvæ of this weevil in numbers near Harrisburg, Pennsylvania, on the dead or dying twigs of sycamore which had been attacked by sycamore blight. The adults, upon emerging in confinement, fed upon the fungous pustules on the bark.

366. *Otidocephalus scrobicollis* (Boh.).

The same authors record¹³ the finding of both pupa and adults of this species near Hummelstown, Pennsylvania, in fallen dead branches of the white oak, *Quercus alba* L.

367. *Otidocephalus dichrous* Lec.

Several examples of this species were beaten from the foliage of cabbage palmetto at Royal Palm Park, in March.

398. *Orchestes ephippiatus* (Say).

This weevil is a very active acrobat, often jumping from one to three feet several times in rapid succession when beaten into an umbrella or sifted onto a paper.

406. *Orchestes rufipes* Lec.

Weiss and Lott have recorded¹⁴ the occurrence of this weevil in numbers at Rutherford, New Jersey, where both adults and

¹² Ent. News, XXXII, 1921, 271.

¹³ Can. Ent., LV, 1923, 115.

¹⁴ Psyche, XXVIII, 1921, 152.

larvæ, during their entire existence, feed on the foliage of the willows, *Salix lucida* Muhl and *S. nigra* Marsh. The adults hibernate in colonies under loose bark, in partly dead wood and other cover. They emerge in April or May and feed on the leaves, doing much damage. Eggs are deposited in May and June, hatch in the latter month and adults of the new brood emerge about the middle of July. There is but one brood each year.

408. *Elleschus scanicus* (Payk.).

Examples of this European species have been received from Edmonton, Alberta, where they were taken by F. S. Carr. It was recorded in the Rhynchophora only from New Jersey and Pennsylvania.

415. *Anthonomus elegans* Lec.

This has been recorded as a submaritime Floridian species, found only on foliage near the sea. Examples are at hand from Palmdale and Royal Palm Park, both inland stations; also from Miami and Caxambus in addition to those previously mentioned. At Palmdale it was swept from a tall St. Johnswort.

433. *Anthonomus subguttatus* Dietz.

Examples of this species vary much in size and general color. One from Palmdale, Florida, also swept from St. Johnswort, is reddish-brown and but 2 mm. in length, while another, identified by H. C. Fall, from Washington, D. C., is piceous-black and 3 mm. in length.

435. *Anthonomus consimilis* Dietz.

Of this species only sporadic individuals from widely distant localities are known. One was swept from low ground herbage along White River in Marion County, Indiana, on May 1, and two others taken at Natick and Monterey, Massachusetts, in July, were received from Frost. Not before recorded east of the District of Columbia.

——. ***Anthonomus bicorostris*, new species.**

Elongate-oval, robust. Reddish-brown, above thinly clothed with short whitish hairs or hair-like scales, these strongly condensed on scutellum and

extreme base of fifth interval, and moderately so around a rather small denuded area on each elytron; basal three-fifths of beak dark reddish-brown, remainder pale brownish-yellow; elytra with a large common rather vague heart-shaped scutellar dusky blotch and each with a short dark oblong spot on first interval and a second longer one on third and fourth intervals within the postmedian denuded area; legs reddish-brown, thinly clothed with whitish hairs; under surface thickly clothed with oblong-oval white scales. Beak rather stout, subcylindrical, as long as head and thorax, male, one-third longer, female. Antennæ slender, inserted in front of middle, scape reaching eye, first joint of funicle clavate, nearly as long as 2-4 united, second one-half longer than third, 3-7 short, subequal; club one-third as long as funicle, fusiform. Thorax slightly wider at base than long, sides feebly rounded, disk distinctly constricted at apical fourth, finely, densely and deeply punctate. Elytra oval, one-third wider at base than thorax, striæ finely and closely punctate; intervals moderately convex, each with rows of fine punctures. Femora each armed with a short conical tooth. Ventrals 3-5 nearly equal in length, the third slightly the longer. Length, 2.5-3 mm.

Common near Miami, Florida, in March, on the foliage of the potato-tree, *Solanum verbascifolium* L., which grows abundantly along the roadsides and margins of Brickell's Hammock; also at Royal Palm Park, but less common, on the same plant. Belongs to Group D, p. 299, of the Rhynchophora, but differs from all the other species by its bi-colored beak, oblong dark spots of denuded elytral area and long clavate basal joint of funicle.

449. *Anthonomus varipes* Duval.

This species was common at both Miami and Royal Palm Park, Florida, but only on the *Solanum* above mentioned, which is very probably its host plant.

455. *Anthonomus squamulatus* Dietz.

A half dozen examples were beaten August 20 from red cedar, *Juniperus virginiana* L., in Putnam County, Indiana. Received also from Holland, Michigan and Kankakee, Illinois.

——. ***Anthonomus australis*, new species.**

Elongate-oval. Color throughout a nearly uniform dark chestnut-brown, thickly and nearly evenly clothed, both above and beneath, with oval white scales, these slightly more condensed along the first and fourth intervals of elytra; scape of antennæ, tibiæ and tarsi paler. Beak rather stout, cylin-

dricul, naked, as long as head and thorax, male, one-fifth longer, female, finely striate and punctate. Antennæ inserted at apical two-fifths of beak, funicle 7-jointed, joint 1 stout, clavate, as long as 2 and 3 united, 2 but slightly longer than 3, 3-7 equal. Thorax slightly wider at base than long, its sides nearly straight, very slightly converging from base to apex, not or very feebly constricted near apex, its sculpture concealed by scales. Elytra only one-fifth wider at base than thorax, humeri and umbones scarcely evident, sides parallel to apical third, thence rounded to apex; disk finely striate, the sculpture concealed; intervals 3, 5 and 7 narrower than the others. Length, 2.5-2.7 mm.

Three specimens taken at Dunedin, Florida, November 17 and December 13, by sweeping tall dead grass along the margins of ponds. Belongs under *aa* of the key to Group G, p. 309, of the Rhynchophora, but distinctly smaller than either *rufipes* or *disjunctus*, with vestiture paler and much more evenly distributed, and lacking the pronotal constriction of the former and the elongate second joint of funicle of the latter.

458. *Anthonomus disjunctus* Lec.

Specimens taken at Lexington, Massachusetts, August 30, are in the Frost collection. Not before recorded from New England.

— ***Anthonomus robinsoni* Blatch.**

Three specimens of this very aberrant Anthonomid have been taken in Indiana in recent years, one in Putnam County, May 16, by sweeping weeds in low woods along the banks of a stream, the others in Marion County, May 30, while sweeping herbage in dense upland woods. It was described¹⁵ from West Point and Batavia, New York, and has not been recorded elsewhere.

— ***Anthonomus xantus*, new species.**

Oval, robust. Head, antennæ and beak reddish-brown; thorax, legs and sutural line fuscous-brown; elytra and under surface pale reddish-yellow sometimes with a fuscous tinge; above sparsely clothed with a very fine straw-yellow pubescence, this condensed on scutellum and slightly so around a postmedian, feebly denuded somewhat darker area on elytra. Funicle 6-jointed, joint 1 subclavate, twice the length of 2, 3-6 moniliform; club short, pubescent, very compact. Beak slender, cylindrical, about as long

¹⁵ Rhyn. N. E. Amer, 312.

as head and thorax united. Thorax slightly wider at base than long, sides feebly rounded, disk constricted near apex, finely and closely punctate, each puncture bearing a fine prostrate whitish hair. Elytra oval, conjointly one-third wider at base than thorax; striae rather deep, marked with close-set round punctures, intervals not wider than striae punctures, feebly convex; umbones prominent, smooth, dull yellow. Under surface finely and sparsely punctate; pubescent with rather long yellowish hairs, these condensed on meso- and metapleura. Front femora armed beneath with a single small acute tooth. Length, 1.6-1.8 mm.

Described from four specimens taken by C. A. Frost at Sherborn, Massachusetts, July 26. Belongs under *a* of Group B. of the subgenus *Sexarthrus*, p. 313, of the Rhynchophora. Differs from the other species there found by the shorter, more robust form, paler elytra, yellow umbones and dense pubescence of the meso- and metapleura.

467. *Anthonomus decipiens* Lec.

The first specimen known from Indiana was swept September 4, 1921, from low herbage along the margin of a pond in the White River bottoms, Marion County.

478. *Pseudanthonomus inermis* Blatch.

Several specimens were swept, March 28, from the flowers of a tall St. Johnswort at Palmdale, Florida. The disk of thorax in this species is evidently but not strongly constricted behind the apex. In the original description it was said to be "not constricted."

482. *Piazorhinus pictus* Lec.

This species is now at hand from Dunedin, Gulfport and Lakeland, Florida. About Dunedin it occurs on low herbage, growing along extinct wet weather ponds.

483. *Piazorhinus thoracicus* Casey.

A single specimen was taken at Istokpoga, Florida, March 29, and another at Dunedin, April 3, both by sweeping in dense hammocks. Known heretofore only from Palm Beach, Florida.

487. *Miarus hispidulus* Lec.

Numerous specimens were taken at Royal Palm Park, Florida, March 27, from between the "boot-jacks" and boles of cabbage palmetto, growing in open pine woods.

504. *Lixus punctinasus* Lec.

Riverdale, Illinois, and Lake County, Indiana, are new stations from which this species has been taken since 1916.

——. ***Lixus novellus*, new species.**

Elongate, subcylindrical. Color, a uniform dark chestnut-brown, sparsely clothed with a fine yellowish-gray prostrate pubescence, this condensed to form a stripe along the sides of thorax, a less distinct one on sides of elytra and also numerous small vague mottlings on elytra; antennæ and tarsi dark reddish-brown. Beak stout, subcylindrical, slightly longer than thorax, finely and sparsely punctate. Head with a short very fine frontal groove. Second joint of funicle one-third longer than the next two united. Thorax about as wide at base as long, its sides parallel on basal half, very slightly converging from middle to apex; disk very finely and rugosely punctate, also with a few larger scattered very shallow punctures, and a deep median groove, widening behind, extending from apical fourth to base. Elytra as wide at base as thorax, their sides straight and subparallel to apical fifth, thence converging to a conjointly rounded apex; disk with an oblong median concavity, continuous with that of thorax, on basal fifth; striæ represented by rows of rather large, rounded shallow close-set punctures. Under surface finely and shallowly punctate and with a longitudinal median groove on metasternum and first and second ventrals. Length, 15 mm.

Steuben County, Indiana, August 5, swept from low vegetation on the borders of a lake. Belongs under *aa.* of Group II, p. 340, of the Rhynchophora. Longer than any member of that group except *fimbriatus*, from which it differs in color, much more slender body, shorter and stouter beak, etc. Probably a member of the Alleghanian fauna.

531. *Baris interstitialis* (Say).

This species has been received from Gainesville, Florida, for naming. It has previously been definitely recorded only from Crescent City, that State, by Wickham,¹⁶ the species so listed by

¹⁶ Bull. Buffalo Soc. Nat. Sci., IX, 1909, 405.

Schwarz from Haulover and Tampa being *B. splendens* Casey. Champlain and Knull have recently recorded¹⁷ the taking of *interstitialis* during the winter from the roots of cocklebur at Harrisburg, Pennsylvania.

Examples of seven species of *Baris* which are not included in the Rhynchopora are at hand from Indiana and Florida, but until opportunity is found to compare them with Major Casey's types, they cannot be definitely placed.

533. *Cosmobaris scolopacea* (Germ.).

This species has been taken by Wolcott in July at Willow Springs, Illinois, this being its first record west of Pennsylvania. It has been recently reared by Champlain and Knull from lamb's quarters (*Chenopodium*), the larvæ working in the pith.

——. ***Centrinaspis argentis*, new species.**

Allied to *picumnus* Hbst., but smaller with thorax shorter. General color the same but scales of upper surface linear, silvery-gray, not yellowish, in hue and much less dense, there being only two rows on each elytral interval instead of three as in *picumnus*; scales of lower surface, smaller, narrower and pure white; also less dense. Males without a spine in front of coxæ. Length, 2–2.3 mm.

Crawford County, Indiana, August 4; several specimens swept from golden-rod. Submitted to Major Casey, who wrote that it was “a new species near *picumnus*, but with shorter and sparser vestiture.”

——. ***Nicentrus wyandottei* Blatch.**

Since this species was described¹⁸ a number of additional examples have been taken at the type locality and one in Putnam County, Indiana, 110 miles farther north.

601. *Oömorphidius laevicollis* Lec.

I was much pleased to secure, during the past winter, four examples of this very rare species at Dunedin, Florida. They

¹⁷ Ent. News, 1921, 272.

¹⁸ Journ. N. Y. Ent. Soc., XXX, 1922, 118.

were taken on December 8 and April 7 by sifting weed debris along the bay front just south of my residence. It had been heretofore taken in Florida only at Crescent City.

610. *Limnobaris puteifer* Casey.

Specimens taken at Southern Pines, North Carolina, May 1, were received from Frost. Known heretofore only from Ohio and Indiana.

625. *Stethobaris corpulenta* Lec.

Several examples of this robust Barid have recently been found at Dunedin, Florida. They were taken in April by sweeping low huckleberry near the margins of a lake.

632. *Zygobarinus coelestinus* (Linell).

Four examples of this rare and handsome weevil were taken in the dense hammock on Paradise Key at Royal Palm Park, Florida, in March, by sweeping low herbage and beating dead limbs along the pathways. It was known heretofore only from Cocconut Grove, that State, the type locality. The specimens taken have the thorax wholly or in great part tinged with purplish-brown.

635. *Catapastus conspersus* (Lec.).

This species has recently been taken in numbers on several occasions from a clump of prickly ash, growing on the bluffs of White River near Indianapolis.

636. *Catapastus diffusus* Casey.

Found frequently in recent years near Dunedin, Florida. Beaten from button-wood, *Conocarpus erecta* L., on Hog Island in March and taken from decaying fungus at base of oak stump in November.

640. *Barinus curticolis* Casey.

A single female of this species, 3.8 mm. in length, was taken at Dunedin, May 29, while sweeping low herbage along a roadside ditch. Known heretofore only from the District of Columbia, Missouri and Louisiana. Casey gives the length as 2.7-3 mm.

- . *Acythopeus orchivora* Blackb., Trans. R. Soc. Aust., 1900, 61.

This is a small, dull black barid weevil, about 3.5 mm. in length, having the beak and legs thickened, the thorax wider than long with sides rounded and disk coarsely punctured. It is an Australian species which has found a foothold in the green-houses of New Jersey, where it attacks orchids of the genus *Dendrobium*. Two closely allied forms, the *A. atterimus* Waterh. and the *A. gilvinotatus* Barber are Philippine species which have been taken in green-houses in the District of Columbia and New Jersey.¹⁹

- . *Diorymerellus laevimargo* Champ., Entom. Mo. Mag., 1916, 200.

Examples of this minute barid are at hand which were taken by H. B. Weiss in green-houses in Bergen County, New Jersey. It is about 1.8 mm. in length, black, strongly shining, the thorax punctate along the front and hind margins, its middle and the entire disk of elytra smooth. It is an introduced Central American form and feeds on the leaves, flower stalks and pseudobulbs of orchids.

653. *Cylindrocopturus nanulus* (Lec.).

Taken frequently in April about Dunedin, Florida, by sweeping tall dead grasses along the margin of ponds and by beating wax-myrtle, *Cerothamnus ceriferus* (L.). Recorded heretofore in that State only from Crescent City and Enterprise.

677. *Acallodes saltoides* Dietz.

New stations for this species are Evanston, Illinois, and Porter County, Indiana; not before recorded from either State.

700. *Ceutorhynchus floridanus* Leng.

A single individual was taken at Dunedin, Florida, April 9, from beneath a board on the bare sand of the bay beach. Known heretofore only from Enterprise and Kissimmee, that State.

¹⁹ See Barber, Proc. Ent. Soc. Wash., XIX, 1917, 12-22.

— **Amalus haemorrhous** Hbst.

This European species has been recorded²⁰ by Buchanan from Syracuse, New York, and specimens from South River and Lakehurst, New Jersey, were sent me by the late E. A. Bischoff. The genus belongs under *b* of the *Phytobii*, p. 454, of the Rhynchophora, and the weevil is a small, oblong robust reddish-brown or blackish form, 1.7 mm. in length, with reddish legs and antennæ, 6-jointed funicle, approximate front coxæ, the thorax without tubercles or postocular lobes and the elytra with a scutellar and a subapical sutural spot of white scales. It bears a close resemblance to *Ceutorhynchus zimmermanni* Gyll., from which it is distinguished by the lack of postocular lobes and more elongate form. Bischoff took it on dandelion flowers. In Europe it occurs on heather, *Calluna vulgaris* L., and as this plant occurs along the Atlantic coast between Newfoundland and Rhode Island, the weevil may also be found in that region.

727. Conotrachelus juglandis Lec.

Two specimens, the first known from Florida, were taken at Dunedin, in March and April, one by beating branches of recently felled pine, the other along a roadway in a dense hammock. Champlain and Knull (loc. cit. 1921) question its occurrence on hickory as mentioned in the Rhynchophora, and state that it breeds in the leaf stems of walnut and butternut. As the only species of Juglandaceæ growing about Dunedin belong to the genus *Hicoria*, the weevil must breed in them if it is limited to that family for a host plant.

734. Conotrachelus elegans (Say).

Champlain and Knull record this weevil as damaging the new growth of hickory in New York. "They were very abundant in May, feeding, mating and egg-laying. The adults damage the stems in feeding and in making egg punctures, and the larvæ work in the shoots and leaf stems, causing them to wilt and fall."

²⁰ Proc. Ent. Soc. Wash., 1923, 79.

— **Conotrachelus maritimus** Blatch.²¹

Specimens are at hand from Everglade, Florida. Known elsewhere only from Dunedin.

— **Conotrachelus biscayensis** Fall.²¹

Taken in some numbers in March both at Miami and Royal Palm Park, by beating along the pathways of dense hammocks. Known heretofore only from Biscayne, Florida.

— **Euscepes deceptus**, new species.

Elongate-oblong, subparallel, convex. Piceous-brown; antennæ reddish-brown, the club paler; head, thorax and basal half of beak thickly clothed above with circular grayish concave scales, and bearing numerous short, blunt pale erect setæ; elytra and legs densely clothed with similar but much smaller brown scales; under surface thinly covered with larger pale flat ones. Beak stout, a little shorter than thorax, subspatulate, its apical half coarsely and shallowly punctate; in repose received in a deep prosternal groove. Antennæ inserted at middle of beak, but about one-third longer than the latter; funicle 6-jointed, joints 1 and 2 subequal in length, 1 much the stouter, obconical, 3 to 6 moniliform. Sculpture of thorax and elytra concealed by scales, the former widest at middle, strongly and broadly constricted at apical third, with numerous pale setæ in front of constriction and two tufts of darker ones behind it. Elytra one-third wider at base than thorax, humeri rectangular, striæ coarsely punctate; disk with scattered tufts of stout dark erect setæ and numerous paler inclined ones behind the middle. Legs beset with similar but shorter setæ. Length, 3.5 mm.

Described from a single specimen taken March 12 while beating in Brickell's hammock, south of Miami, Florida. Larger and with a very different vestiture from *E. porcellus*, our only other eastern member of the genus.

— **Tyloderma laevicollis** Blatch.

The third known example of this Floridian species was taken at Istokpoga March 28, while sweeping Ericads along the margin of the lake.

782. **Acalles carinatus** Lec.

A single specimen was taken near Indianapolis, Indiana, June 14, from beneath the bark of a dead sugar maple. Known in the State heretofore only from Posey County.

²¹ For notes pertaining to the last two species see Journ. N. Y. Ent. Soc., XXVIII, 1920, 172.

784. *Acalles granosus* Lec.

Several specimens have been taken both at Dunedin and Royal Palm Park, Florida, by beating the foliage of cabbage palmetto.

790. *Acalles sylvosus* Blatch.

This species, known heretofore only from the types taken at Little River, Florida, was beaten in some numbers from dead branches along the pathways of the dense hammock on Paradise Key.

798. *Apteromechus ferratus* (Say).

Champlain and Knull record (loc. cit.) the breeding of this species in Pennsylvania "in the outer corky bark of sassafras." In Florida it breeds in the red-bay, a tree closely related to the sassafras, both belonging to the family Lauraceæ.

803. *Cryptorhynchus lapathi* (Linn.).

In recent years this European willow weevil has been taken in Porter and Kosciusko counties, Indiana, and probably occurs throughout the northern half of that State.

807. *Cryptorhynchus obtentus* (Hbst.).

This species, heretofore known in Florida only from Enterprise and Biscayne Bay, is at hand from Dunedin, Moore Haven and Royal Palm Park, that State. It has there been taken only by beating dead limbs in dense hammocks. In Pennsylvania it has been reared from decaying limbs of the black birch, *Betula lenta* L.

810. *Cryptorhynchus apiculatus* Gyll.

Two examples of this scarce weevil have been taken in April at porch light at my residence in Dunedin, Florida.

816. *Acamptus rigidus* Lec.

The second known specimen from Indiana was taken September 2 from beneath the bark of a dead beech in Marion County.

817. *Anchonus floridanus* Schwarz.

Two individuals, the only ones known from the west coast of Florida, were taken December 1, from beneath a piece of bamboo on the bay beach at Dunedin.

818. *Anchonus duryi* Blatch.

From two to a half dozen specimens of this subarctic species are taken each winter beneath cover along the same beach.

830. *Cossonus subareatus* Boh.

Examples of this species, taken by F. S. Carr, at Edmonton, Alberta, are at hand. It has not before been recorded from that country.

838. *Stenomimus pallidus* (Boh.).

Up to 1923 this species was known in Indiana only from Vigo County. On October 1st, that year, sixty or more were taken in Putnam County from beneath the loose bark of a walnut stump, the bole of which had been felled the previous year. It probably occurs plentifully throughout its range beneath walnut bark with the proper modicum of moisture present, but is overlooked on account of its small size.

——. ***Pentarthrinus dissimilis*, new species.**

Allied to *P. nitens* Horn. Color the same. Differs in having the body more slender; beak broader, less convex, and without a fovea in the basal impression; thorax narrower, widest at middle, more narrowed in front, its punctures coarser, more widely separated; elytral striae with punctures more rounded; intervals narrower, each with a single row of very fine punctures. Length, 2.3–2.7 mm.

Dunedin, Lakeland, Cape Sable and Hillsborough Canal, Florida; December to April. A rather common species in southern Florida, where it occurs on bunches of Spanish moss and dead vines in dense hammocks; in spring taken beneath chunks along the beaches at Cape Sable and Dunedin. Heretofore confused with *P. nitens*, but very distinct in the characters mentioned above.

852. *Pentarthrinus anonus* Blatch.

A dozen or more specimens were taken at Royal Palm Park March 17 by beating masses of dead moon-vine along the borders of hammocks. Described from Lake Okeechobee and not recorded elsewhere. It is probable that the moon-vine instead of the custard apple, *Anona glabra* L., is its host plant, as the former was abundant at both stations while the *Anona* was not found at the Park.

858. *Lirolepta stenosoma* Blatch.

Taken by scores March 24, 1922, along the Hillsborough Canal, southwest of Lake Okeechobee, by beating the moon-vine and custard apple mentioned above. Both adults and larvæ were found in the stems of the moon-vine, and the adults in or beneath the bark of the dead *Anona* twigs.

859. *Rhynchophorus cruentatus* (Fab.).

Numerous larvæ, pupæ and adults of this, our largest native weevil, were sent me from New Smyrna, Florida, in April, 1924, with the statement that the finest date palm in that place had recently died, and that the beetle in all stages was found in burrows at the bases of the leaves. Some of the citizens thought that the weevils caused the death of the tree, but it is more likely that they found it a suitable host and breeding place after death had begun.

860. *Rhodobaenus tredecimpunctatus* (Ill.).

Weiss and Lott have recently given²² an interesting account of the life history of this species, based on observations made in Central New Jersey. They found it breeding in iron-weed, *Vernonia noveboracensis*, the eggs being deposited singly in the upper portion of the young stem and hatching in June. Pupation began in August, the adults emerging in September and hibernating.

—. *Metamasius mosieri* Barb.

Several specimens were beaten from dead leaves of cabbage palmetto and others from dead air plants, *Tillandsia utriculata* L., at Royal Palm Park in March.

²² Ent. News, XXXIV, 1923, 103.

— **Eucactophagus weissi** Barber, Proc. Ent. Soc. Wash., XIX, 1917, 21.

This large Calandrid weevil occurs in greenhouses in New Jersey, where it feeds on the bulbs of various species of orchids. It is 13–17 mm. in length, and has the elytra yellowish with suture, base, sides in part and apical fourth black. A single specimen of a closely allied species, *E. graphipterus* Champ., has been taken in Connecticut.

862. *Sphenophorus inaequalis* (Say).

Examples taken at Monterey, Massachusetts, July 14, were received from Frost. Not before recorded from New England.

864. *Sphenophorus latinasus* Horn.

A single specimen of this handsome Calandriid, known heretofore only from the unique Georgia type, was taken at Moore Haven, Florida, March 27, 1922, while sifting the roots of a tall bunch-grass growing in the muck prairie formed at that point by draining the old bed of Lake Okeechobee. The weevil agrees in nearly all particulars with the original description, the only important difference being that the median vitta of thorax is slightly dilated at middle instead of being “not dilated,” as stated by Horn. The natural coating of the intervals between the vittæ of thorax, as well as of the whole elytra except the elevated basal half of third interval and a small humeral and sub-apical callus, which are shining black, is of a purplish hue and under the lens appears to be minutely alutaceous. The most distinctive features of the species are the broadly bilobed third tarsal joints of all the legs and the peculiar beak which is strongly compressed and much enlarged at tip as described in the Rhynchophora.

875. *Sphenophorus cariosus* Oliv.

An example of this species, reared from a larva found feeding on the buds of cocoanut, March 6, and which issued as adult, May 12, was sent me for naming by Prof. A. H. Beyer of Gainesville, Florida.

880. *Sphenophorus retusus* Gyll.

Chittenden, *loc. cit.*, below, p. 155, has placed this species as a synonym of the *Calandra necydaloides* Fabr., and gives his reasons for so doing. The original description of Fabricius (1801), as well as that of Olivier (1807), of *necydaloides* are quoted by Chittenden. Both are very brief and could apply to any one of a half dozen species known from this country at present.

890. *Sphenophorus pontederiae* Chitt.

Since 1916 this species has been taken in some numbers at Dunedin, Lakeland and Ft. Myers, Florida. It occurs in muck around or near the decaying roots of pickerel-weed.

891. var. *Sphenophorus venatus rectus* Say.

A single example, so determined by Dr. Chittenden, was taken August 30, 1923, from beneath a chunk on the bank of the Ohio River near Leavenworth, Crawford County, Indiana. From typical *venatus* it differs in its smaller size (6.5 mm.); dark red color without surface coating; antennal club much smaller, more rotund; disk of thorax more flattened, much more densely punctate, the vittæ much narrower, vaguely defined; elytral intervals narrower, not alternating in width or elevation, much more coarsely punctate, the punctures of sutural intervals distinct and very close-set. This form was placed by Horn as a synonym of *venatus*.²³ In this he was followed by other authors, including Chittenden.²⁴ That author has now changed his opinion (Ms.) and in view of the differences above mentioned, regards the form as well worthy of a varietal name.

892. *Sphenophorus vestitus* Chitt.

Chittenden, *loc. cit.*, below, p. 152, states that the form so named by him "is simply a smooth gray-coated variation of *S. venatus* Say, not entitled even to a varietal name."

* * *

Dr. F. H. Chittenden has recently published²⁵ an article entitled "New Species and Varieties of *Sphenophorus*, with Notes

²³ Proc. Am. Ent. Soc., XIII, 1873, 426.

²⁴ Proc. Ent. Soc. Wash., VI, 1904, 131.

²⁵ Proc. Ent. Soc. Wash., 1924, 145.

on Certain Other Forms.” In this he describes as new two species and four varieties from the region covered by the *Rhyncho-phora* of N. E. America. These, briefly mentioned, are as follows: the page numbers in parentheses referring to that work:

—. *Sphenophorus schwarzii* Chitt.

A species 12 mm. in length, black with porcelain-gray crust on elytra, most of lower surface and legs. “Allied to the *aequalis* group (p. 553) but differs noticeably in the nearly straight slender rostrum, flat pronotum with declivous sides, strongly villous lower surface and strongly fimbriate legs” (*Chittenden*).

Described from Fortress Monroe, Virginia.

—. *Sphenophorus setiger intervallatus* Chitt.

Differs from typical *setiger* (p. 557) in having the first five elytral intervals long, wide and subequally elevated.

New Jersey, New York, Massachusetts and Texas.

—. *Sphenophorus peninsularis nasutus* Chitt.

Alutaceous natural coating much less than in the typical form (p. 557). Beak of female only three-fourths as long as thorax. Length, 12.5–14.5 mm.

New York and vicinity.

—. *Sphenophorus robustus rectistriatus* Chitt.

If, as its author states, there “are all possible intergradations between this form and *robustus*”—why does he encumber nomenclature by giving it a name?²⁶

—. *Sphenophorus blatchleyi* Chitt.

“Similar in general appearance to *zeæ* Walsh (p. 566), from which it differs in the lack of basal protuberance of the beak, much coarser and shallower elytral punctures, more densely punctate lower surface and narrower third joint of anterior tarsi” (*Chittenden*).

Described from Ormond, Florida.

²⁶ See Journ. N. Y. Ent. Soc., XXXII, 1924, 130.

— *Sphenophorus germari pinguis* Chitt.

“Shorter and more robust than typical *germari*; elytra little longer and scarcely wider than prothorax. Anterior tibiae moderately angulate below the middle, nearer the apex than in *germari*. Length, 8 mm.” (*Chittenden*).

Described from Tampa, Florida.

* * *

Additional errors and omissions discovered in the “Rhynchophora” since the former list was published²⁷ are as follows:

Page.

- 126. Fourteenth line, insert “beneath” after “separated.”
- 176. In key, *humilis* should follow *c* and *anthracinus*, *cc*.
- 176. Transfer “at base” in fifth line under *H. mirabilis* to the next line after “wide.”
- 279. In key *b*. should be *bb*.
- 377. In key, after *11*, delete first “s” in metasternum.

WATER BEETLES

A noteworthy report on “Water Beetles in Relation to Pond-fish Culture, with Life Histories of Those Found in Fishponds at Fairport, Iowa,” by Charles Branch Wilson has been issued as Document 953 from the Bulletin of the United States Bureau of Fisheries, vol. xxxix, 1923–24. This report deals in detail with such subjects as locomotion, migration, structural adaptations, enemies of the larvæ, pupæ and adults, distribution of the species in ponds at Fairport, systematic descriptions of Fairport species, and contains keys for the identification of larvæ and pupæ and much biological information. In addition it is illustrated by 148 figures and carries an extensive bibliography.—ED.

²⁷ Journal N. Y. Ent. Soc., XXVIII, 1920, p. 177.

JOHN BUNCLE'S DROLL ACCOUNT OF A BATTLE BETWEEN A FLEA AND A LOUSE

BY HARRY B. WEISS

NEW BRUNSWICK, N. J.

The Life and Adventures of John Bunce by Thomas Amory was first published in 1756 and it is supposed that the author sketched, in this book, parts of his own career. Much of it is taken up with religious, moral and contemplative circumambulations and the entomological account is one of such digressions.

Thomas Amory has been called the "English Rabelais" and although some biographical accounts persist in stating that he was of unsound mind, this belief was ably repudiated in 1822. Bunce's nativity appears to be in doubt, but he was the son of Councillor Amory, who was appointed secretary for the foreign estates in Ireland by William III. He lived at one time in Westminster and died on November 25, 1788, at the age of ninety-seven.

An interesting summary of what is known of his life together with the controversial accounts thereof has been written by Ernest A. Baker.¹ In the following statement John Bunce describes what he saw through a "double reflecting optical instrument."

"In the double reflecting telescope, a louse and a flea were put; which are creatures that hate each other as much as spiders do, and fight to death when they meet. The flea appeared first in the box, and as he was magnified very greatly, he looked like a locust without wings; with a roundish body, that is obtuse at the end, and the breast covered with an armature of a triangular figure; the head small in proportion to its body, but the eyes large, red, and very fierce; his six legs were long, robust and made for leaping; the antennæ short, but firm and sharp; its tail was scaly, and full of stings, and its mouth pointed into active pincers: his color was deep purple.

¹ The Life and Opinions of John Bunce, Esquire, by Thomas Amory, with an Introduction by Ernest A. Baker, M.A. New York: E. P. Dutton and Co.

“The louse in white was next brought on, and had a well shaped, oblong indented body: his six legs were short, made for walking and running, and each of them armed at the extremity with two terrible claws: the head was large, and the eyes very small and black: its horns were short and jointed, and could be thrust forward with a spring. Its snout was pointed, and opened, contracted, and penetrated in a wonderful manner.

“The first that was brought on the stage was the flea, and to show us what an active one he was, he sprung and bounced at a strange rate: the velocity of his motions in leaping were astonishing; and sometimes he would tumble over and over in a wanton way: but the moment the louse appeared, he stood stock still, gathered himself up, and fixed his flashing eyes on his foe. The gallant louse did with a frown for some time behold him, and then crouching down, began very softly to move towards him, when the flea gave a leap on his enemy, and with his dangerous tail and pinching mouth began to battle with great fury; but the louse soon made him quit his hold, by hurting him with his claws and wounding him with his sharp snout. This made the flea skip to the other side of the box, and they both kept at a distance for near a minute, looking with great indignation at each other, and offering several times to advance. The louse did at last in a race, and then the flea flew at him, which produced a battle as terrible as ever was fought by two wild beasts. Every part of their bodies was in a most violent motion, and sometimes the flea was uppermost, but more frequently the louse. They did bite, and thrust, and claw one another most furiously, and the consequence of the dreadful engagement was, that the flea expired, and the louse remained victor in the box: but he was so much wounded that he could scarce walk. This battle was to me a very surprising thing, as each of them was magnified to the size of two feet; but considering what spees or atoms of animated matter they were, it was astonishing to reflection to behold the amazing mechanism of these two minute things, which appeared in their exertions during the fray. It was still more strange to see the aversion these small creatures had to each other, the passions that worked in their little breasts, and the judgment they showed in their endeavors to destroy one another.”

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY

MEETING OF MARCH 18, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M. on March 18, 1924, in the American Museum of Natural History, President Harry B. Weiss in the chair with 17 members and three visitors present.

Mr. Nicolay reported for Field Committee, stating that the next trip would be to Wyandanch on April 6.

Mr. C. F. Dalman, 70 West 126th St., was elected an active member of the Society.

Mr. Davis reported that Dr. Bequaert had reached Havana en route for Central America.

Mr. Davis also read from a letter from J. H. Emerson referring to the 50th anniversary of Cambridge Entomological Club and the survival of five of its founders, viz.: Emerton, Mann, Schwarz, Dimmock and Henshaw.

Letters were read from the family of the late E. A. Bischoff and from M. D. Leonard.

The secretary was instructed to prepare a letter introducing Dr. Leonard to Entomologists in Spain for his use while in that country.

Mr. Barber spoke on "Maternal Care shown by Certain Hemiptera." A specimen of *Pachycoris fabricii* from Porto Rico was exhibited and the behavior of the nymphs in running to the mother when disturbed was described. In support of this observed example of maternal care references were given from various authors to similar behavior in the case of *Elasmotethus griseus* of Europe, specimens of which were also shown.

Mr. Glick read a paper on "Entomology in Arizona" in which, after showing by maps and descriptions, the fragments of agricultural land surrounded by mountains and desert, he discussed some specific problems of economic entomology in Arizona, especially the *Thurberia* boll weevil and the connection of the moth *Myelois venipars* with the citrus black rot, *Alternaria citri*, which Mr. Glick thought was secondary. Specimens were exhibited of all these and of the work of thrips on citrus leaves.

Several members joined in discussion of collectors and collecting places in Arizona, Mr. Glick pointing out the value of natural tanks in rock basins in the mountains.

Mr. Davis exhibited a beetle new to the United States, *Stenodontes chevrolati*, found on Big Pine Key, Florida, in 1914, by a boy he and Mr. Sleight had interested during their visit in September, 1913. Mr. Mutchler, who identified the insect, said it was known from Cuba and the Bahamas.

MEETING OF APRIL 1, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M. on April 1, 1924, in the American Museum of Natural History, Vice-President Frank E. Lutz in the chair with 12 members and one visitor present.

The treasurer stated that Mr. L. B. Woodruff had paid \$50 for the reprints of his article in the March Journal and \$100 towards its cost, which amounts would be included in receipts for April.

In consideration of Mr. Woodruff's gift to the publication cost, he was elected a Life Member of the Society and the secretary was instructed to write to him how sincerely his fellow members appreciated his generosity.

Mr. Mutchler read report of Outing Committee, giving details of proposed trip to Wyandanch on April 6.

Mr. Leng read a letter from R. P. Dow describing a remarkable migration of *Pyrameis cardui* which will be printed in Miscellaneous Notes.

Mr. Leng read also the editorial by Carl Heinrich in Proceedings Entomological Society of Washington XXVI, recommending discretion "in the promiscuous description of new species unconnected with revisional work, identifying keys, food plant or rearing records."

Mr. Davis read a further letter from Mr. Dow in which entomology and personal matters were entertainingly combined.

Mr. Mutchler exhibited "Insectæ Portoricensis" by George N. Wolcott in which the work of members of the Society was frequently mentioned.

Mr. Glick announced the death on March 24 of Alex. D. MacGillivray, recently elected a member of the Society; the secretary was instructed to send an expression of sympathy to his family.

Mr. Hall gave an interesting account of "Early Butterfly Collecting in Wind River Range, Wyoming," illustrated by specimens of 30 species, viz.: *Papilio glaucus*, *Parnassius smintheus*, *Pieris napi*, *Euchloe ausinides* and *sara*, *Eurytheme eriphyle*, *Coenonympha pamphiloides* and *haydeni*, *Erebia epipsodia*, *Brenthis helenæ*, *frigga* and *freijs*, *Euphydrya anicia* and *giletti*, *Phyciodes montana*, *Polygonia faunus* and *zephyrus*, *Aglais antiopa*, *Vanessa cardui*, *Mitura spinetorum*, *Incisalia eryphon*, *Callophrys affinis*, *Heodes snowi*, *Philotes glaucon*, *Plebeius saipiolus*, *Phaedrotes piasus*, *Glaucopsyche lygdamas*, *Hesperia ruralis*, *Thanaos icelus* and *persius*. These were collected on six clear days between June 19 and 29, at a ranch 7,500 feet elevation or in a cold valley near it; and the differences in the species caught in the two localities were emphasized. A little collecting was done on ridges 9,000 feet high but, owing to the late season, the snow was still too deep for any collecting on the 13,000 feet peaks. Photographs of the locality were shown; also a light net with which a few of the specimens were caught from horseback.

In the general discussion which followed the migrations of butterflies, the occurrence of cold valleys, and Mr. Heinrich's editorial, were freely discussed.

Mr. Bridwell exhibited unidentified beetle larvæ in the seeds of *Xanthium* (burdock) and in the stems of *Chenopodium* (goosefoot).

MEETING OF APRIL 15, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M. on April 15, 1924, President Harry B. Weiss in the chair, with 14 members, and six visitors present.

Mr. Sherman reported for the Publication Committee that Mr. Notman had resigned the editorship of the Journal and that the Committee had been fortunately successful in prevailing upon Mr. Weiss to assume the duties of editor.

On motion, duly seconded and carried, the secretary was instructed to write Mr. Notman expressing the Society's thanks for his services and its acceptance of his resignation.

Mr. Nicolay for the Field Committee reported on the last field trip and announced one for April 20 to Roselle Park.

Mr. Woodruff's acknowledgment of his election as a life member was read.

Dr. Avinoff spoke of the "Position of *Parnassius* and its Relation to other Genera of Papilionidæ," illustrating his remarks by the small part of his collection which survived the Revolution in Russia, and by several maps to show distribution. A box of American Museum specimens, prepared by Mr. Watson, was also used to illustrate the relation of the genus to *Papilio*. The preponderance of palaearctic species was first explained, there being but four species in North America, and the mountainous habit of most species, with an extraordinary abundance in Tibet, was stated. The close relationship of the American species with Siberian species was exhibited and their position as migrants was affirmed. Passing then to the larvæ and pupæ Dr. Avinoff showed the resemblances between *Parnassius* and *Papilio* larvæ particularly in the osmateria or scent glands, and between the lightly cocooned chrysalis of *Parnassius* and the belted chrysalis of *Papilio* and *Pieris*. The studies that have been made by various authors of the legs, the antennæ, the palpi, and the pouch-like appendages of the female abdomen were reviewed; with a final conclusion that *Parnassius* was an archaic type, exhibiting great recent development especially in the recently elevated region of Pamir.

His remarks were discussed by Dr. Lutz and others bringing out the holoarctic character of the genus *Parnassius* and the uncertainty as to the proper position for certain genera from Australia and South America which have been associated with it on the basis of venation but of which the life history is unknown. Dr. Avinoff's remarks follow in detail.

The genus *Parnassius* comprises 37 species of which over 350 local races, variations and aberrations have been described.

Central Asia is especially abundant in the representatives of this genus that reaches its main development in high alpine zones.

It is confined to the Holarctic region, 4 species inhabiting North America in Alaska and along the Rocky Mountains, 4 species are found in Europe; all the rest belongs to the Asiatic fauna. There are no *Parnassii* in Africa.

The family of Papilionidæ to which the *Parnassius* belongs has a position among the Rhopalocera usually assigned close to the Pieridæ, though some authors like Dr. Karl Jordan, on the basis of the structure of the antennæ are inclined to range this family not far from the Nymphalidæ. Some characteristics even show certain affinity with the Hesperidæ.

The genus *Parnassius*, on the basis of structural studies has to be placed in the Papilionidæ family, though some authors like Swainson, Elwes, Edwards and others were inclined to create a special family of Parnassidæ, the main reason for that being the peculiarity of the pupa which is inclosed in a light cocoon. Other close genera like *Doritis* and *Hypermnestra* have the same characteristics of Heterocera, like pupation.

Another peculiarity of the Parnassii, shared by the allied genera of *Luhedorfia*, (Oriental) *Eurycus* (Australian) and *Euryades* (South American) is the strange pock-like appendix of the females that is absent only in *Parnassius* Sims Grey.

The comparison of patterns of the Parnassii points out as the oldest group those of the genus that possess a row of blue spots along the margin of their posterior wings. This characteristic is found in *Doritis* (Archon) too, which in every way seems to be the closest living representative of the group allied to this extinct Doritites and Thaitites found in the tertiary strata.

The striation on the wings of the *Doritis* is a remnant of a pattern of great phylogenia antiquity and corresponds to the analogous markings on the wings of another order of insects—the Trichoptera—especially in the Phryganidæ.

The glacial epoch had a great influence on the present distributions of the Parnassii on various mountain chains of Eurasia and partly on the plains as is the case with *P. mnemosyne*, *Stubendorfi* and some forms of *Apollo*.

The American representatives are undoubtedly of an Asiatic province and one can presume that the *Clodius* and *Smintheus* are the result of an earlier migration whereas *Nomion* and *Eversmanni*, scarcely modified from the corresponding species of the old world and confined to Alaska, reached the American soil comparatively in a more recent epoch.

The Parnassii furnish an illuminating reason to study the Holarctic region as a whole, as the old and new world in the temperate zone manifest a close affinity. It is in the Southern sections of the Palearctic and Nearctic faunas that the original characters of every continent begin to manifest themselves alongside of the vanishing general features of the Arctic type.

The faunas of the Palearctic and Nearctic regions represent thus a structure of strata with different values. The Mediterranean fauna corre-

sponds to the Sonoran in America and further on are substituted by widely different tropical types.

Mr. Davis exhibited his collection of *Osmoderma*, pointing out the color difference in the sexes and some remarkably small and slender specimens from New Hampshire and Maine. He also exhibited larvæ feeding in the seeds of burdock.

Chalcoides fulvicornis Fab.

In all American catalogues and literature regarding this halticine beetle, so far as the writer can learn, the species has always been listed or mentioned as *Crepidodera helxines* Linn. There is nothing about the original description of Linnaeus by which this species can be identified and it would appear well to adopt the name used in European catalogues and other works, *Chalcoides fulvicornis* Fab. In 1913, Franz Heikertinger¹ published a note on this species, and after dissecting the male genital organs of European and American forms, which are figured and apparently show specific differences, suggested cataloguing the American species as *Chalcoides fulvicornis nana* Say.² Heikertinger's articles appear to have been completely overlooked by American writers. *Ch. splendens* Weise is indicated as a synonym and the distribution is given as Europe, Asia and North America and the name *Ch. helxines* Weise is similarly assigned to another species, *Ch. smaragdulus* Foudr. Since the above was written, Chas. Schaeffer³ has called attention to *Ch. helxines violacea* Melsh., assigning this name to the purple and bluish-red specimens, which may now be called *Ch. fulvicornis violacea* Melsh. This form has been known by the writer for years as occurring in abundance on *Prunus serotina* at Ithaca, N. Y., and in the vicinity of the District of Columbia.

Specimens also have been seen which are blue, brown-bronze, and green-bronze. Typical *Ch. fulvicornis* is brilliant green with yellow antennæ and legs.—F. H. CHITTENDEN.

¹ Halticinae, Sonderabdruck Fauna Germ., Kaefer Deutsch. Reich. IV, 1913, p. 155.

² Verhandl. K. K. Zool.-bot. gesell. Wien., 1911, pp. 3-11.

³ Jour. Ent. Soc., N. Y., XXXII, p. 145, 1924.

The New York Entomological Society

Organized June 29, 1892—Incorporated June 7, 1893

The meetings of the Society are held on the first and third Tuesday of each month (except June, July, August and September) at 8 P. M., in the AMERICAN MUSEUM OF NATURAL HISTORY, 77th Street and Eighth Avenue.

Annual dues for Active Members, \$3.00.

Members of the Society will please remit their annual dues, payable in January, to the treasurer.

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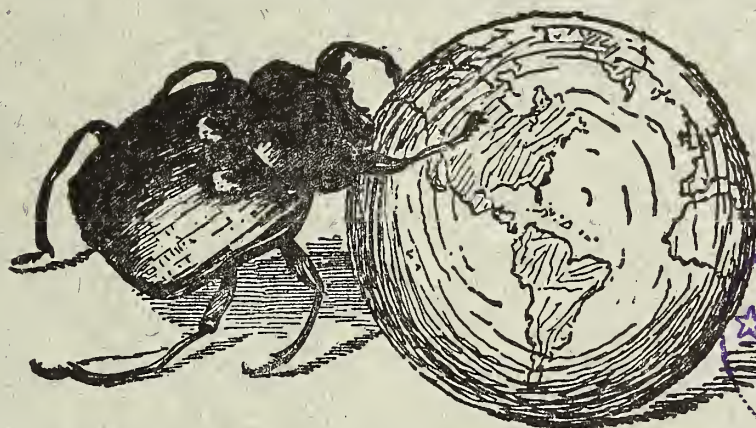
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SEPTEMBER, 1925

Edited by **HARRY B. WEISS**

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F. E. LUTZ

J. D. SHERMAN, JR.

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JOURNAL

OF THE

New York Entomological Society

VOL. XXXIII

SEPTEMBER, 1925

No. 3

NEW PHASIIDAE AND TACHINIDAE FROM NEW YORK STATE

BY LUTHER S. WEST

DEPARTMENT OF ENTOMOLOGY, CORNELL UNIVERSITY, ITHACA, N. Y.

The following preliminary descriptions of thirty forms supposed to be new are offered at the present time in order that the names may be included in the New York State List of Insects, soon to be published. Full descriptions, from which the following have been abstracted, will be published in the "Monograph of Northeastern Tachinidae." The author hopes to bring about the completion of the latter within the coming year. One thousand manuscript pages and over a hundred illustrations are now practically ready, but at least fifty additional species remain to be treated before final revision can be undertaken.

All the types of the following species are retained at Ithaca for the present.

FAMILY PHASIIDAE

Gymnosoma dubia, new species.

Male: Small yellowish fly. Front less than half as wide as either eye. Antennæ black, four-fifths as long as face; third segment one and one-fourth times length of second. Arista dark, slightly pubescent, thickened on basal third. Cheeks less than one-fifth eye height. Dorsum of thorax golden, pleuræ grayish. Four dorsal vittæ. One pair of acrostichals, one, sometimes two postsutural dorso-centrals. One sternopleural, a tuft of weak pteropleurals. Wings hyaline; apical cell closed, ending just before wing tip.

Petiole twice as long as small cross-vein. Legs black. Abdomen deep yellow, portions golden pollinose. Length, 5.5 mm.

Female differs as follows. General color black. Front slightly wider than half of either eye. Face more silvery than golden. Dorsum of thorax shining black. Squamæ more whitish. Tarsal claws shorter. Abdomen black, silvery pollen replacing the golden pollinose areas of the male.

Described from seven males and five females, taken as follows: Ithaca, New York, June 17, 1920, one male, one female, June 22, 1920, one female, September 5, 1919, one male, one female (both reared by R. Matheson from *Cosmopepla bimaculata* Thomas); Spencer Lake, N. Y., June 30, 1907, one male, one female, Cascadilla Creek (near Ithaca), August 12, 1921, one male; Spring Lake, Cayuga Co., July 22, 1918, one male; Trenton Falls, N. Y., June 5-8, 1921, one male (Leonard and Forbes); Lake Ridge, N. Y., July 1, 1920, one male, one female. Holotype, male, Ithaca, June 17, 1920; Allotype, female, Lake Ridge, July 1, 1920.

The sexual dimorphism is about as in *Cistogaster immaculata* Macq., but if we are to rely on length of antennae for generic diagnosis, this species must be referred to *Gymnosoma*. There is a possibility that my species is the same as *Cistogaster occidua* Walk., which, according to Townsend and others, is distinct from *immaculata* Macq. At present I am very dubious as to the accuracy of most determinations of *occidua*, however, and therefore prefer to describe this species as new, especially since a host record is involved.

Phasia brevineura, new species.

Male: Small grayish fly. Front, at narrowest part equal to distance between posterior ocelli. Either side of front bristly two-thirds its width. Antennæ black, half as long as face. Third segment one and a half times length of second. Arista thickened on basal two-fifths. Cheeks one-sixth eye height. One postsutural, one sternopleural, one stout pteropleural bristle surrounded by a tuft of lesser hairs. Scutellum with one stout marginal pair besides the apicals. Wings faintly yellowish at base, all veins bare. Last section of third vein less than one-third as long as preceding section, and terminating at very apex of wing. Legs brown, tarsi yellowish. Claws and pulvilli long. Mid-tibia with an inner bristle. Abdomen flattened, two-thirds as broad as long, viewed from above brassy-black; from behind, gray-pollinose laterally. Genitalia conspicuous, directed forward. Length, 4 to 5 mm.

Female unknown. Description drawn from four specimens taken as follows: Ithaca, N. Y., July 2, 1916 (holotype), July 21, 1923, September 10, 1919; McLean, N. Y., August 12, 1916. Since the preparation of the above description another specimen, collected at McLean, by Dr. C. K. Sibley, September 7, 1924, has come to hand. The label shows it to have been taken in one of the grass bogs of the McLean Wild Life Preserve. The distribution so far seems to be strictly limited to the Ithaca region, and it may even be that those specimens bearing Ithaca labels were actually taken at McLean, as is known to be the case with considerable of the material in the Cornell University Collection.

Phasia cara, new species.

Male: Small dark colored flies. Front as wide as ocellar triangle. Antennæ black, three-fifths as long as face; third segment one and a half times length of second. Proboscis robust, about equal to head length. Cheeks one-seventh eye height. Thorax subshining, not vittate. Thoracic chaetotaxy as in *brevineura*. Wings hyaline, all veins bare. Last section of third vein nearly two-fifths as long as preceding section. Posterior cross-vein nearly straight. Squamæ grayish-white. Legs dark brown. Claws shorter than in *brevineura*. Mid-tibia with an inner bristle. Abdomen broad, flattened. First segment and small triangular spot on anterior border of segments two and three and all of segment four, opaque gray-pollinose. Genitalia as in *brevineura*. Length, 3 to 4 mm.

Described from three male specimens taken as follows: Karner, N. Y., October 4, 1904, one specimen (holotype), November 4, 1914, one specimen, Ithaca, N. Y., July 17, 1900, one specimen, the last smaller than the others and very possibly a distinct variety.

Phasia furva, new species.

Female: Small dark fly. Eyes nearly contiguous. Antennæ black; half as long as face or a little more. Third segment one and a half times as long as second. Arista thickened on basal third. Proboscis a trifle shorter than in *cara*. Cheeks one-eighth eye height. Dorsum of thorax opaque, pleuræ more silvery. Vittæ indistinct, present only before the suture. Chaetotaxy of thorax as in preceding species. Wings hyaline, all veins bare. Last section of third vein one-third as long as preceding section, and attaining margin at very apex of wing. Squamæ distinctly brownish. Legs black. Claws as long as last tarsal segment. Abdomen three-fifths as broad as long,

brassy black or thinly pollinose according to the angle at which surface is viewed. Genitalia awl-shaped, directed backward. Length, 4 to 5 mm.

Described from a single specimen (holotype) collected by Robert Matheson at Truro, Nova Scotia, August 12, 1913.

I have now before me three additional specimens, all collected at McLean by Dr. C. K. Sibley in 1924. The dates are 27 August, 7 September, 14 September. All were taken on grass bogs. I have compared these specimens with the one from Nova Scotia and see no difficulty in making them paratypes.

FAMILY TACHINIDÆ

SUBFAMILY TACHININÆ

Didyma setifacies, new species.

Male: Small dark fly. Face receding, front half as wide as either eye. Ocellars weak, frontals extending to middle of third antennal segment, several orbital hairs. Antennæ black, nearly as long as face, third segment three times as long as second. Proboscis short, palpi yellow. Cheeks nearly one-third eye height. Eyes hairy. Thorax black, the dorsum brassy. Two indistinct brown vittæ. Postsuturals three, sternopleurals three, one strong pteropleural. Wings hyaline, no costal spine. Apical cell just closed in margin, ending barely before wing tip. Fourth vein sometimes with a short appendage. Squamæ light brown. Mid-tibia with an inner bristle. Abdomen black, base of last three segments thinly pollinose. First segment bare, second with two discal pairs of macrochaetæ and a marginal pair, third with two discal pairs and a marginal row, fourth generally covered with stout spines. Length, 4.5 mm.

Female differs as follows: Front two-thirds as wide as either eye. Orbital hairs not so dense, two pairs of strong orbital bristles. Eyes less densely hairy. Abdomen more robust. Claws and pulvilli a little shorter.

Described from a series of nine specimens, all from Albany, N. Y., collected by Mr. D. B. Young as follows: May 6, 1911, one male (holotype), three males (paratypes), one female (paratype); May 10, 1912, one female (allotype); April 24, 1913, three males (paratypes).

An additional male, collected by the writer along Cascadilla Creek, near Ithaca, April 30, 1922, appears to be the same.

I am not quite certain as to just how the genus *Didyma*

should be restricted, but there seems no difficulty in placing our species here, if we understand the genus in the broad sense of Van der Wulp.

Eulasiona catskillensis, new species.

Male: Small grayish fly. Face slightly receding. Eyes nearly contiguous. Ocellars present. Frontals descending to middle of second antennal segment. No orbitals. Antennæ two-thirds as long as face. First two segments yellow, third black, one and a half times as long as second. Proboscis short, palpi yellow. Cheeks two-fifths eye height. Eyes and sides of face hairy. Thorax dark, covered with grayish pollen; vittæ indistinct. Postsuturals three, sternopleurals three, one medium-sized pteropleural. Wings hyaline. A pair of small costal spines. Apical cell barely open, ending just before wing tip. Legs black. Mid-tibia with an inner bristle. Claws and pulvilli long. First abdominal segment with one pair of marginals, second with two pairs of discals and a marginal pair, third with two pairs of discals and a marginal row, fourth rather generally covered with long, slender bristles. Length, 6.5 mm.

Described from a single specimen bearing the label E. Jewitt, Catskill Mts., N. Y., and collected by W. T. Davis, April 18, 1913.

Eulasiona neglecta, new species.

Female: Face not perceptibly receding. Front as wide as either eye. Frontals proper extending to middle of second antennal segment, but nearly continuous with facial macrochaetæ which extend to lower border of eye. Orbitals present. Antennæ black, four-fifths as long as face, third segment two and one-half times as long as second. Proboscis short, palpi brownish. Eyes hairy. Thorax black, sprinkled with grayish pollen. Four dorsal vittæ. Postsuturals three, sternopleurals three, a pteropleural of medium size. Wings hyaline. No strong costal spine. Third vein bristly almost to small cross-vein. Apical cell barely open, ending just before wing tip. Legs black. Mid-tibia with an inner bristle and with one on outer front side near middle (*catskillensis* has three). Abdomen rather robust, in coloration like the thorax; first segment without macrochaetæ, second and third each with a marginal pair, fourth with three or four scattered discals and a marginal row. Length, 6 mm.

Described from a single specimen bearing the label Ithaca, N. Y., June. For several reasons, and especially because of shape of head, this species does not make a particularly good *Eulasiona* and may, eventually, have to be referred elsewhere.

It is nevertheless close to this genus and may well be placed here for the present at least.

***Hyperecteina aestivalis*, new species.**

Female: Small blackish fly. Face receding. Front two-thirds as wide as either eye. Frontals descending to middle of second antennal segment. Orbitals present. Antennæ black, as long as face; third segment six times as long as second. Facial ridges bristly one-half their height. Proboscis short, palpi black. Cheeks two-fifths eye height. Sides of face with irregular row of black hair near the ridge. Thorax grayish, two heavy vittæ and the scutellum, shining black. Postsuturals three, sternopleurals two, one weak pteropleural. Wings hyaline. A small pair of costal spines. Apical cell closed in margin, ending just before wing tip. Legs black, front tarsi dilated. Mid-tibia with an inner bristle. Abdomen black bases of last three segments pollinose. First segment with one pair of marginals, second with a discal and a marginal pair, third with a discal pair and a marginal row, fourth with a discal row and some weak marginals. Length, 5 mm.

Described from four specimens. Holotype from McLean, N. Y., July 3, 1900; paratypes without locality label but presumably from McLean also. Males unknown.

***Hyperecteina bishopi*, new species.**

Female: Differs essentially from *aestivalis*, n. sp., as follows: Head at vibrissæ somewhat shorter. Antennæ more nearly equalling length of face. Fine hairs on sides of face arranged in a single row. Wings more clearly hyaline.

Male may be distinguished by more slender abdomen, with characteristic genitalia; also by possession of anterior tarsi similar in form to those of middle and posterior legs.

Holotype, female, taken at Clyde, N. Y., July 27, 1913, by S. C. Bishop. Allotype, male, taken at Ringwood, near Ithaca, N. Y., June 26, 1920, probably by M. D. Leonard. Paratype, female, from Baiting Hollow, L. I., Oct. 3, 1913 (H. C. Hockett).

***Hyperecteina consternata*, new species.**

Male: Medium-sized blackish species. Face receding. Front one-half as wide as either eye. Frontals to middle of second antennal segment, the lower ones diverging. Antennæ three-fourths as long as face, third segment scarcely twice as long as second. Proboscis short, palpi orange-yellow. Sides of face bare above, on lower half with patch of fine hair, not arranged in rows. Thorax grayish. Four black vittæ. Postsuturals three, sternopleurals

three, a pteropleural of medium size. A small pair of costal spines. Apical cell just open, ending slightly before wing tip. Legs black, mid-tibia with an inner bristle. Claws and pulvilli long. Abdomen black, bases of last three segments pollinose. First segment with a pair of marginals, second with a discal pair and a marginal row; fourth with a discal pair, a strong submarginal and a weak marginal row. Length, 8.5 mm.

Described from a single specimen collected by Dr. Hockett, at Baiting Hollow, L. I., July 8, 1923.

***Hyperecteina duospinosa*, new species.**

Male: Differs from *unispinosa* Coq. principally by the possession of two bristles at the base of the third vein instead of a single bristle in this position. It may prove to be a synonym of that species but I prefer to assign it a new name, especially since *unispinosa* has been hitherto recognized chiefly by this very character.

I have but a single specimen, collected by Dr. Hockett at Baiting Hollow, L. I., August 18, 1923.

***Hyperecteina extricata*, new species.**

Female: Small blackish fly. Face receding. Front nearly as wide as either eye. Frontals to middle of second antennal segment. Orbitals present. Antennæ black, nearly as long as face; third segment four times as long as second. Proboscis short, palpi almost black. Cheeks one-third eye height. Sides of face each with irregular row of fine hair. Thorax blackish; two vittæ, indistinct. Postsuturals three, sternopleurals three, one small pteropleural. Wings hyaline. A pair of small costal spines. Apical cell very short-petiolate, ending just before wing tip. Legs brownish, anterior tarsi not dilated. Mid-tibia with an inner bristle. Abdomen brownish black, fairly robust. First segment with a pair of marginals, second with a discal and a marginal pair, third with a discal pair and a marginal row, fourth with a discal row and an apical cluster. Length, 3.5 mm.

Described from a single specimen taken at Albany, N. Y., August 1, 1912.

***Wagneria vernata*, new species.**

Differs from *Wagneria* (*Phorichaeta*) *sequax* Will. as follows:

Male: Vitta just above antennæ but little more than half width of either parafrontal. Second antennal segment and basal two-thirds of arista, yellow. Sternopleurals three, sometimes four. Infuscation of wings much paler. Petiole of apical cell averaging fully as long as apical cross-vein. Spur at bend of fourth, minute or wanting. Usually no discals on abdominal segments two and three.

Female similar to male save that front is slightly wider than either eye, tarsal claws and pulvilli are shorter, and wings have more of a yellowish cast in the costal region.

Described from two males and two females all from Ithaca; June 2, 1900, one male, May 8, 1913, one male (holotype), May 21, 1913, one female (allotype), Beehive Pond, May 29, 1913, one female.

SUBFAMILY DEXIINÆ (Family *Dexiidae* of American authors).

Ateloglossa calyptrata, new species.

Male: Medium-sized grayish fly. Face not receding. Narrowest part of front scarcely wider than ocellar triangle. Frontals weak, orbitals wanting. Antennæ half as long as face, third segment twice length of second. Arista plumose on basal four-fifths. Facial carina prominent. Vibrissæ above oral margin. Proboscis fairly short, palpi wanting. Cheeks one-half eye height. Thorax grayish, dorsal vittæ five. Postsuturals four, sternopleurals three, one stout pteropleural. Wings hyaline, no costal spine. Apical cell barely open in margin, ending just before wing tip. Squamæ brown. Legs black. Abdomen blackish, with pale golden pollinose covering. First and second segments without macrochaetæ, third and fourth each with a marginal row. Length, 9.5 mm.

Described from a single specimen bearing the label Selden, L. I., 5-8-23.

Ateloglossa glabra, new species.

Female: Face somewhat receding. Front as wide as either eye. Orbitals present, both pairs strong. Antennæ half as long as face, third segment nearly three times length of second. Arista plumose to tip. Carina conspicuous. Proboscis short, palpi wanting. Cheeks almost equal to eye height. Thorax grayish, five dorsal vittæ. Postsuturals four, sternopleurals three, one stout pteropleural. Wings hyaline. No costal spine. Apical cell closed in margin, ending just before wing tip. Squamæ grayish-white. Legs black to reddish, mid- and hind-tibia each with an inner bristle. Abdomen robust, grayish pollinose in irregular pattern. First and second segments without macrochaetæ, third with a pair of marginals, fourth with a marginal row. Length, 9 mm.

Described from a single specimen collected by Mr. D. B. Young, at Wells, N. Y., July 26, 1918.

Chaetona addenda, new species.

Female: Small, slender grayish fly. Face slightly receding. Front as wide as either eye. Three pairs of orbitals. Antennæ three-fourths as long as face, third segment three times length of second. Arista short-plumose for two-thirds its length. Proboscis short, palpi yellow. Cheeks less than one-sixth the eye height. Eyes and sides of face, bare. Thorax grayish black, no distinct vittæ. Three postsuturals, two sternopleurals, no true pteropleural. Wings hyaline, apex smoothly rounded. A fairly strong pair of costal spines. Apical cell open, ending near wing tip. Legs dark, tibiæ and portions of femora yellowish. Mid-tibia with an inner bristle. Abdomen tapering. First three segments with discal hairs but no true discal macrochaetæ. First without marginals, second with one marginal and two dorso-lateral pairs, third with a marginal row, fourth sparsely and irregularly covered with spines. All tergites meeting ventrally. Length, 6.5 mm.

Described from a single specimen collected by the writer from Renwick (Stewart) Park, Ithaca, N. Y., Aug. 23, 1921.

Chaetona ordinaria, new species.

Female differs from *addenda* as follows: Face scarcely, if at all receding. Front slightly wider than either eye. Antennæ practically as long as face, third segment twice as long as second. Palpi dark brown. Cheeks one-fifth eye height. Apical cell terminating at extreme tip of wing. Second segment of abdomen with only a very weak pair of marginals. Length, 5.5 mm.

Described from a single specimen collected by the writer not far from the base of Mt. McIntyre, Adirondack Park. Label reads "Ausable River to Wood's Farm, July 1, 1923."

Eutheresia satisfacta, new species.

Male: Medium-sized grayish fly. Face noticeably receding. Front one-third as wide as either eye. No orbitals. Antennæ brownish-yellow, two-thirds as long as face, third segment nearly three times length of second. Arista medium plumose for four-fifths its length. Proboscis short, palpi yellow. Thorax grayish-black. Dorsal vittæ five. Postsuturals four, sternopleurals two, one stout pteropleural. Wings hyaline. No costal spine. Apical cell open, ending close to wing tip. Fourth vein with small spur. Squamæ white. Legs black, mid- and hind-tibia each with an inner bristle. Hind tibiæ obscurely ciliate. Abdomen black, certain areas pollinose. Second segment with one pair of marginals, third and fourth each with a marginal row. Length, 10.5 mm.

Described from a single specimen labelled Staten Island, N. Y., Aug. 25 and loaned me by Mr. W. T. Davis.

Eutheresia sibleyi, new species.

Male differs from *satisfacta* as follows: Antennæ three-fifths as long as face, first two segments and basal third of last, yellow, remainder of third dark. Last segment one and a half times as long as second. Arista short-plumose to tip or nearly so. Thoracic vittæ usually three. Axillary region of wing somewhat dusky. Length, 8.5 mm.

Female unknown. Described from five specimens, all taken near the summit of Mt. McIntyre, Adirondack Park. Four were collected June 30, one July 4, 1923 (holotype). Two were taken by S. C. Bishop, one by M. D. Leonard, and the remaining two by Dr. C. K. Sibley, in honor of whom the species is named.

Myiocera amicabilis, new species.

Male: Face not at all receding. Front scarcely wider than ocellar triangle. Frontals weak, orbitals wanting. Antennæ brownish, half as long as face, third segment two and a half times length of second. Arista medium-plumose to tip. Facial carina conspicuous. Proboscis short, palpi brownish-yellow. Cheeks one-half eye height. Thorax grayish, three heavy dorsal vittæ. Postsuturals, four; sternopleurals, two (rarely three?); two or three stout pteropleurals. Wings hyaline. No costal spine. Apical cell open, ending slightly before wing tip. Mid-tibia with inner bristle. Hind tibiæ not ciliate. Abdomen robust, first three segments reddish-brown, fourth yellow. Second with a pair of marginals, third (in type) with one discal bristle and a marginal row, fourth covered with heavy bristles. Length, 11.5 mm.

Described from a single specimen collected by F. C. Wixom at Ithaca, N. Y., July 19, 1917.

Myiocera compacta, new species.

Female: Large robust dark-colored fly. Face not at all receding. Front very sloping. Front nearly as wide as either eye. Three pairs of orbitals. Antennæ wholly yellow, nearly two-thirds as long as face. Third segment nearly three times length of second. Arista with diminishing plumosity to tip. Carina conspicuous. Proboscis short, palpi yellow. Cheeks more than half the eye height. Sides of face bare. Thorax grayish, three heavy dorsal vittæ. Postsuturals four, sternopleurals three, one stout pteropleural. Wings hyaline. No costal spine. Apical cell open, ending before wing tip. Squamæ white. Legs black. Mid-tibia with two, hind-tibia with two or three inner bristles. Hind-tibia ciliate. Abdomen globose, black in color, faintly sprinkled with pollen. Second segment with a pair of marginals, third and fourth each with a marginal row. No abdominal discals. Length, 12 mm.

Male unknown. Described from two specimens collected by the writer at Ringwood Hollow, near Ithaca, July 30, 1922.

Ptilodexia hucketti, new species.

Male: Large bristly long-legged flies of reddish coloration. Face not receding. Front twice width of ocellar triangle. Face, front and occiput more or less golden. No orbitals. Antennæ yellow, two-fifths as long as face, third segment one and a half times length of second. Arista long-plumose to tip. Carina small, inconspicuous. Vibrissæ a short distance above oral margin. Proboscis short, palpi yellow. Cheeks three-fifths eye height. Thorax golden pillinose. Five brownish vittæ, indistinct. Postsuturals four, sternopleurals three, one stout pteropleural. Wings hyaline, no costal spine. Apical cell open, ending before wing tip. Squamæ faintly yellowish. Legs yellow, mid-tibia with one, hind-tibia with two or three inner bristles. Abdomen rather elongate, generally reddish, median dorsal line darker. Chætotaxy variable, usually one pair of marginals on segment one, two pairs of discals and a marginal pair on segment two, two pairs of discals and a marginal row on segment three, fourth segment covered with stout bristles. Length, 14.5 mm.

Female differs as follows: Front as wide as either eye. Three pairs of orbitals. Postsuturals frequently but three. Abdomen more robust, usually but one pair of discals on each of segments two and three.

Described from nine male and five female specimens taken at the following localities: Riverhead, L. I., two males, two females; Lakehurst, N. J., three males, one female; Yaphank, N. Y., four males; Albany, N. Y., one male; Fire Island, N. Y., one female. The last named was taken on Sept. 7, 1912, all the others in July or August. The Albany specimen was collected by Dr. M. D. Leonard, the Lakehurst and Yaphank specimens were loaned me by Mr. W. T. Davis, and the Riverhead specimens were collected and sent me by Dr. H. C. Hockett, in honor of whom the species is named. Holotype male, Riverhead, July 30, 1922; allotype female, Riverhead, August 22, 1922.

Ptilodexia incerta, new species.

Male: Large, long-legged flies. Face not receding. Face and front silvery. Front scarcely wider than ocellar triangle. No orbitals. Antennæ yellow, half as long as face, third segment one and three-fourths times length of second. Arista long plumose to tip. Carina fairly conspicuous. Vibrissæ somewhat elevated. Proboscis short, palpi yellow. Thorax black covered with grayish or golden pollen. Dorsal vittæ five. Postsuturals three, very rarely a small fourth, sternopleurals three to five, one large (several lesser) pteropleurals. Wings as in *hucketti*. Legs black, tibiæ somewhat yellowish. Mid-tibia with one, hind-tibia with two inner

bristles. Abdomen rather elongate, black dorsally, the sides reddish. First segment without true macrochaetæ, all the others densely covered with stout bristles, variable in number. Length, 13.5 mm.

Female differs as follows: Front nearly as wide as either eye. Two pairs of orbitals. Abdomen more robust, chaetotaxy less dense. In allotype there are two discal pairs and one marginal pair on segment three.

Described from four male and four female specimens from the following localities: Riverhead, L. I., one male, June 30, 1921 (holotype), one male Aug. 20, 1922, one female, Aug. 6, 1922 (allotype), Southampton, L. I., one male, July 15, 1923; Wading River, L. I., one female, Aug. 26, 1923; West Point, N. Y., one female, Sept. 2, 1917; Staten Island, N. Y., one male, June 27, 1915; Douglas Lake, Mich., one female, July 4, 1922. The last named specimen appears to differ slightly, and may prove not to belong to this species.

Ptilodexia leucoptera, new species.

Male unknown, female differs from *incerta* principally as follows: Front fully as wide as either eye. Antennæ two-thirds as long as face, third segment at least twice as long as second. Wings milky throughout. A small, but distinct pair of costal spines. All veins unusually pale. Legs not especially long, for the most part dark brown in color. Mid-tibia with two, hind-tibia with two or three inner bristles. Abdomen less robust, black throughout, sprinkled with grayish pollen. First segment without macrochaetæ, second with one discal and one marginal pair, third with a discal pair and a marginal row, fourth with a number of large bristles, irregularly arranged. Length, 8.5 mm.

Described from a single specimen bearing the label Riverhead, Long Island, Sept. 17, 1913.

Ptilodexia minor, new species.

Female: Large, robust flies. Front to eye width as 18 : 13. Front viewed in profile noticeably convex. Two pairs of orbitals. Antennæ usually less than half as long as face, yellow, save for tip which is darker. Third segment less than twice as long as second. Arista gradually tapering, fairly long-plumose to tip. Carina inconspicuous. Vibrissæ well above oral margin. Proboscis short, palpi yellow. Checks over three-fifths eye height. Thorax grayish; four darker vittæ. Postsuturals three or four, sternopleurals three, one large pteropleural (several lesser ones). Wings hyaline, similar to *hucketti*. Legs black, tibiæ and parts of femora yellowish. Mid-tibia with one inner bristle. Abdomen black, very robust. First segment without macrochaetæ, second with one pair of discals and a marginal pair, third with

a pair of discals and a marginal row, fourth with a discal row and a marginal row. Abdomen faintly reddish laterally. Length, 11 mm.

Male unknown. Described from two specimens collected by the writer at Duck Lake, N. Y., Aug. 6, 1921, and one specimen bearing the label Muncy, Ind., Aug.-Sept. '07. A fourth specimen labelled No. Creek, N. Y., Aug. 9, 1910, may belong to this species. Holotype, one of Duck Lake specimens.

Ptilodexia obscura, new species.

Female: Medium-sized grayish flies. Face not receding. Front two-thirds as wide as either eye. Three pairs of orbitals. Antennæ three-fifths as long as face, basal segments yellowish, third segment dark. Third one and a half times length of second. Arista thickened on basal fourth, long plumose nearly to tip. Carina inconspicuous. Vibrissæ somewhat elevated. Proboscis short, palpi yellow. Cheeks two-thirds eye height or a little less. Sides of face coarsely hairy. Thorax grayish black, three indistinct dorsal vittæ. Postsuturals three, sternopleurals three, one stout and several lesser pteropleurals. Wings hyaline. Two very small sub-equal costal bristles. Apical cell open, ending before wing tip. Fourth vein with sometimes a short spur. Legs black; mid- and hind-tibiæ slightly reddish, each bearing two inner bristles. Abdomen black, sprinkled with grayish pollen. Second segment with one or two pairs of discals and a marginal pair, third with one pair of discals (rarely two pairs) and a marginal row, fourth rather densely covered with stout bristles. Length, 6.5 to 8 mm.

Males unknown. Described from three specimens loaned the writer by Mr. W. T. Davis and collected as follows: Wading River, L. I., June 29, 1917 (holotype), Yaphank, N. Y., July 8, 1916; Lakehurst, N. J., May 31, 1918.

This species does not make a very typical *Ptilodexia*. In certain respects it seems to be allied to *Dinera*, but it cannot well be referred there for a number of reasons which we have not space to discuss here. If we do not restrict our concept of *Ptilodexia* too narrowly, *obscura* may be referred here without difficulty.

Ptilodexia proxima, new species.

Male: Large, long legged flies. Face not receding. Face scarcely wider than ocellar triangle. No orbitals. Antennæ three-fifths as long as face, yellowish, except tip, which is darker. Third segment twice length of second and much more slender. Arista long plumose to tip. Carina narrow,

but fairly conspicuous. Vibrissæ somewhat elevated. Proboscis short, palpi yellow. Cheeks nearly two-thirds eye height. Sides of face bearing a small number of short hairs, mostly light in color. Thorax black, covered with grayish pollen; probably five vittæ, none distinct. Postsuturals four, sternopleurals three or four, two stout (several lesser) pteropleurals. Wings hyaline, without characteristic venation. Legs black, all tibiæ rufous. Mid-tibia with one, hind-tibia with two inner bristles. Abdomen reddish, median dorsal line and most of segment one, darker. Pollinose ornamentation, golden. First segment without macrochaetæ, second with a mass of discals and a marginal pair or two, third with a mass of discals and a marginal row, fourth densely covered with macrochaetæ. Length, 14 mm.

Described from a single specimen taken at Riverhead, L. I., and loaned the writer by Mr. W. T. Davis, for study.

Note. The above six species are herein referred to *Ptilodexia* by reason of the presence of a greater or lesser amount of hair on the parafacials. Those forms lacking this character, *i.e.*, with the parafacials bare, are referred to *Rhynchodexia*. There is great doubt as to whether this character can be made to hold, and it is more than probable that in the end but a single genus will here be recognized. *Rynchodexia* should in that case be used, *Ptilodexia* becoming a synonym.

***Rhamphina leonardi*, new species.**

Male: Rather large, slender flies. Face receding very slightly. Front one and a half times as wide as either eye. Two pairs of orbitals. Antennæ nearly as long as face, yellowish, except the tip which is darker. Third segment three times as long as second. Arista very short plumose. Carina very faint. Proboscis long and slender, fully twice the head height. Palpi yellow. Cheeks three-fifths eye height. Sides of face bearing black hairs. Thorax grayish black, four indistinct dorsal vittæ. Postsuturals three, sternopleurals three, one stout and several lesser pteropleurals. Wings hyaline. One stout and one weaker costal spine. Apical cell short-petiolate, ending before tip. Fourth vein appendiculate. Mid-tibia with an inner bristle. Abdomen black, sparsely covered with grayish pollen. First segment without macrochaetæ, second with two discal pairs and one marginal pair, third with variable discal bristles and a marginal row, fourth with one weak discal and one strong discal row besides the usual row of marginals. Length, 11 mm.

Female unknown. Described from two specimens collected by Dr. M. D. Leonard on Shelving Rock Mt., Lake George, N. Y., Sept. 2, 1920.

These specimens were determined for the writer by Dr. J. M. Aldrich as *Rhamphina* sp. with the suggestion that the form was probably new. This appears to be the first noted occurrence of the genus in North America.

***Rhynchodexia elevata*, new species.**

Male: Rather large, bristly fly. Face not receding. Front scarcely wider than ocellar triangle. Antennæ a trifle more than half as long as face, third segment fully twice as long as second, and much more slender. Arista thickened on basal fifth and long-plumose to tip. Carina obscure. Vibrissæ above level of oral margin a distance fully twice length of second antennal segment (diagnostic character). Proboscis short, palpi yellow. Cheeks one-half the eye height. Thorax grayish-black, with five dorsal vittæ. Scutellum reddish. Postsuturals three, sternopleurals three, one to several stout pteropleurals. Wings hyaline, without characteristic venation. Legs dark brown, tibiæ somewhat yellowish. Mid-tibia with one or two, hind-tibia with two or three inner bristles. Abdomen rather elongate, mostly reddish in color, the median dorsal region darker. Second segment with a group of discals and a marginal pair, third with two pairs or a group of discals and a marginal row, fourth covered with stout spines. Length, 10.5 mm.

Female unknown. Described from three specimens taken as follows: Riverhead, L. I., Aug. 20, 1922 (holotype); Lakehurst, N. J., Sept., 1898; Canville, N. J., Aug., 1910; the first collected by Dr. H. C. Hockett, the others by Mr. W. T. Davis.

***Rhynchodexia translucipennis*, new species.**

Male differs from *elevata* principally as follows: Front a trifle narrower. Antennæ yellow, three-fourths as long as face, third segment two and a half times length of second. Vibrissæ above oral margin a distance not greater than half length of second antennal segment. Rarely a weak fourth postsutural present. Wings distinctly milky throughout, all veins very pale. Inner bristle of mid-tibia weak or absent. Abdomen black, sprinkled with grayish-pollen. Second segment with two distinct pairs of discals and a marginal pair, third with two or three pairs of discals and a marginal row, fourth with bristles arranged in three irregular rows. Length, 9.5 mm.

Female unknown. Described from two specimens collected by the writer; one at Ithaca, N. Y., July 18, 1921 (holotype), the other at McLean Bogs, Tompkins Co., N. Y., July 21, 1921.

BIOLOGICAL NOTES ON ARACHNOCORIS ALBO-MACULATUS SCOTT (HEMIPTERA; NABIDAE)¹

BY J. G. MYERS

1851 SCIENCE EXHIBITION SCHOLAR FOR NEW ZEALAND, 1924

BUSSEY INSTITUTION, BOSTON

In 1881 John Scott described as two new species of a new Nabid genus some South American insects which were sent to him by the araneologist, Pickard Cambridge, accompanied by a note that "they were found living *en famille* with colonies of spiders." In 1890 Reuter formed for this genus a distinct subfamily which, however, in 1908 he rejected on the discovery of *Parachnocris*, a genus from Demevara evidently connecting *Arachnocris* with the more typical members of the subfamily Nabinæ (Reduviolinæ). Meanwhile, Bergroth in 1899 described a third species from South America, discovered by Simon, the French araneologist. Later, in 1914, Bergroth published a further note on the genus with a description of a fourth species from South America and some valuable revisional data. Uhler's species, *Velidia berytoides*, from the West Indies and Distant's *Herdonius* (?) *panamensis* from Panama were both shown, by comparison of the types in the British Museum to belong to *Arachnocris*. The distribution and extent of the genus were thus fully elucidated, but nothing of the nature of biological data was added. Finally in 1916 Bergroth described *A. trinitatis* from Trinidad, bringing the number of known species up to seven, which in this paper by synonymy is reduced to six. The range of the genus as now understood includes South America as far south as Brazil (Rio Janeiro), Panama, the island of Trinidad, and Grenada (West Indies). It is thus essentially neotropical.

To Drs. W. M. Wheeler and Nathan Banks I am indebted for the opportunity of describing the nymph for the first time and

¹ Contribution from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 245.

of recording some additional biological data of great interest. Their material comprises eight males, nine females and four nymphs, taken together in the same spider webs and obviously conspecific.

Nomenclature.—There is some confusion as to the correct name of the present species. Scott's description of the Brazilian *A. albomaculatus* agrees with that of Distant's *A. panamensis* (described in the Mirid genus, *Herdonius* Stal) except that the middle femora of the former are said to be incrassated and the middle tibiae curved and basally thickened, while *panamensis* is normal in these respects. There is also slight divergence in coloration. The present material might be identified with either species since the above structural characters are present in the males and absent in the females. There would therefore be no hesitation in synonymising *albomaculatus* and *panamensis* were it not that no less an authority than Bergroth (1914) having examined the unique types in the British Museum, concluded that they were distinct, since the types of both are males and the incrassated middle femora can thus not form a mere sexual character. A study of the present series shows, however, that the sexes are much less easily distinguished than in more typical Nabidæ, while the colored figure of *A. panamensis* given by Distant in the *Biologia* seems an admirable representation of the female of the present species. The indications are therefore that *panamensis* is a synonym of Scott's earlier species. This conclusion is supported by Bergroth's own statement that he has received a specimen of the true *albomaculatus* from Panama, and by the fact that Reuter (1890, p. 293) on the other hand recorded a Rio Janeiran specimen which agreed apparently in every respect with *A. panamensis*. Mr. W. E. China has kindly examined the types, and has written under date 21, Nov. 1924, "*A. albomaculatus* Scott is a ♂. *A. panamensis* Dist. is an ♀. I consider that they are the two sexes of the same species. . . ."

Arachnocoris albomaculatus Scott

Advanced nymph.—(Figures 1 and 2.) Shape very like that of a long-legged ant, but the long, almost filiform antennæ rather detract from this resemblance. Metathorax and more so the anterior abdominal segments much constricted like the petiole

of an ant. Dorsally the immediately post-basal abdominal segments form a conspicuous rounded swelling like the scale on the petiole of an ant. General color shining reddish brown, abdomen darker.

Head and pronotum reddish brown, the latter with a median pale longitudinal streak extending on to mesonotum. Mesonotum paler. Eyes red.

Anterior half of abdomen including the constricted portion whitish with four transverse crimson bars, the petiolar "scale" brown, and the connexivum transparent except where crossed by the crimson bands; this portion of the body thus looking even narrower than it really is. Posterior half of abdomen deeper castaneous with three rather more chitinated plates black. Scent-gland orifices in minute indistinct dark areas anterior to these plates. Anal segment yellowish with a black ring.

Ventral surface of head and thorax yellowish brown tinged in places with red; abdomen reddish with four very distinct heavily chitinated plates nearly black. Apex of mesepimeron and to a less extent of mesepisternum sharply marked off in ivory white.

Antennæ brownish, first segment much paler medially, second with dark distal half but actual apex pale, third uniformly dark brown, fourth dark at base and apex.

Rostrum brownish, darker distally.

Legs reddish brown, trochanters and bases of tibiæ whitish, apices of tibiæ, bases and apices of tarsi infuscated.

Head shorter than pronotum, about as long as wide, wider behind than in front of eyes; post-ocular part about half as long as long diameter of eye, with pale impressed line extending mesad from the inner angle of each eye (much as in *Nabis subcoleoptratus* Kirby). Caudad of this line in some specimens (older?) are two dark spots corresponding in position to the ocelli of the adult except that they are rather closer together. Rostrum almost reaching hind coxæ, first segment short, second four-fifths as long as third, third long and slender, fourth less than half length of third. Clypeus elevated, antennæ inserted rather low. Antennæ not quite as long as body, basal and apical segments somewhat thicker than the two intermediate ones; comparative lengths as 2:3:4:3; sparsely and shortly haired.

Pronotum one and a half times as wide as long; greatest width posterior to middle and exceeding that of vertex including eyes; posterior border almost straight, with a collar indicated only laterally; posterior border somewhat excavated but with a median projection.

Mesonotum as long as pronotum, somewhat convex; wider than pronotum. Scutellum indicated by small white projection. Hemelytral pads reaching base of "scale" on petiole, closer together at apex than at base.

Metanotum in middle only one-third length of mesonotum. Whole metathorax strongly constricted.

Abdomen oval, pointed caudally; basal segments strongly constricted and provided dorsally with a prominent rounded knob, the whole base simulating the petiole and scale of an ant. Abdomen convex dorsally and exceedingly so ventrally. The whole dorsal surface shows a marked weakness of chitination, the only tergites chitinated in a normal manner being the three posterior ones, and these are so reduced in size that I was at first uncertain how to interpret them.

Fore coxæ extremely long. Both fore and middle femora somewhat thickened, and supplied ventrally with two irregular rows of short, stout black bristles. Fore and middle tibiae about as long as the respective femur and trochanter. Hind femora shorter than hind tibia as 7:9. Tarsi 2-segmented, the basal segment short.

Length of body, 3.8-4.0 mm.

Barro Colorado Island, C. Z., Panama; taken with 17 imagines, 13th to 31st, July, 1924, W. M. Wheeler (nos. 721, 802), N. Banks. The four nymphs vary somewhat in size, especially in the abdomen, but judging by the hemelytral pads all are in the same stadium. Bergroth (1921, p. 86) believes that *Nabis* has six nymphal instars. If *Arachnocoris* also has six then the instar just described is either fifth or sixth.

I have compared these nymphs very carefully with the description of nymphal *Nabis* (*Reduviolus*) *subcoleoptratus* Kirby as given by Bergroth (1921, pp. 85-87). The agreement in subfamily characters is very close and both species resemble ants to a remarkable degree; but the appearance is brought about

largely in a different manner in the two species. Thus Bergroth writes of *N. subcoleoptratus*, "Zu der Ähnlichkeit im Profil tragen wesentlich bei die aufgebogenen hinteren Seitenwinkel des Metanotums, welche die aufrechtstehende 'Schuppe' der Ameisen vortäuschen." But in *Arachnocoris* the striking similitude of the formicine scale is produced in no sense by the metanotum but entirely by the basal portion of the abdomen.

Imago.—Scott's detailed description is good except so far as the rostrum is concerned and Reuter (1890, p. 293) has corrected this point. The males in the present material differ from Scott's description in that the pronotal collar is black instead of brown and the margin of postero-lateral angles of pronotum is narrowly edged with white—a character not mentioned by Scott but given by Distant in *A. panamensis*. In this connection Mr. W. E. China writes, "*A. albomaculatus* Scott has the posterior lateral margins of the pronotum narrowly pale."

The practical absence in the adult of the normal Nabid thickening of the anterior femora in both sexes is remarkable. Reuter (1908, p. 129) seeks to explain it in the following sentence: "Der von den übrigen Reduviolen abweichende Bau der Beine, deren vordere Schenkel nicht dicker als die übrigen, ist wahrscheinlich eine ökologische Anpassung; die Arten dieser eigentümlichen Gattung sollen, nach Scott, in den Nestern der Spinnen symbiotisch leben." Apparently Reuter thought that the prey is probably rendered more or less helpless by the webs and powerful raptorial fore-legs are not necessary. Only close observation in the field can, however, settle these points.

The tarsal claws are remarkably modified. Those of a typical Nabid, e.g., *Nabis capsiformis* Germ., are very long and slightly curved (Figure 4). The claws of *Arachnocoris*, on the other hand, are relatively much smaller, straighter and capable of being appressed much closer to the tarsus, in a position which appears to be normal to the species, and which forms efficient hooks doubtless enabling the insect to walk suspended upside-down from spider webs as observed by Drs. Wheeler and Banks. As the latter observer remarks they could not possibly progress in any other way on the single strands which make up the labyrinth of a Theridiid web.

The color scheme of *Arachnocoris* is worthy of remark. The ground color is black or a deep purplish black, relieved with glistening silver or china white on the posterior lateral margins of the pronotum, upturned apex of scutellum, middle and apex of corium, bases of hind tibiae, and ventrally on the whole of the swollen, strongly chitinated porcelain-like gula, apices of episterna and epimera, a band on the abdominal pedicel, the posterior margins of some of the basal abdominal segments and finally on a row of five embossed spots arranged segmentally on each side of the basal half of abdomen. These segmental spots are probably connected with abdominal stigmata 1 to 5. The orifice of the odoriferous gland is marked by an abrupt squarish elevation, jet-black tipped with white. White markings of this peculiar quality are rare in the Heteroptera and contrast very strongly with the drab coloration of more typical Nabids. At the same time they remind one forcibly of the color scheme in *Argyrodes*, a genus of Theridiid spiders which live as commensals in the webs of large orb-weaving spiders, and hang from the lines like dew-drops glistening in the sun. The same contrasted coloration with a similar silver-white occurs also, though to a less marked degree in certain of the orb-spinners which are accustomed to remain suspended in the center of their webs, *e.g.*, members of the genera, *Cyclosa*, *Nephila*, *Argiope*. It would seem then that a color scheme in which glistening silver is contrasted with dark color is characteristic of Arthropods which spend their lives suspended in spider-webs. The phenomenon is apparently comparable with the tendency of desert animals to become drab colored, of pelagic organisms to become transparent, and so on through all the other color correspondences between animal and environment usually ascribed to protective resemblance.

There is another aspect to the coloration of *Arachnocoris*. The general shape of the body in the imago, with the marked petiolation of the basal abdominal segments and the strong ventral convexity of the abdomen, produce a considerable degree of resemblance to an ant. This superficial similarity is strengthened by the white markings at the middle of the corium, where the hemielytra would otherwise obscure the basal abdominal constriction. There are thus two elements in the color scheme and body-

form of these bugs, one characteristic of exposed web-dwelling Arthropods generally, the other common in ant mimics. Of these the former is superficially predominant, but the latter has involved greater structural modifications. In the nymph also both elements are present but their relations are reversed, indicating probably that myrmecoidy is an older character of the species than is the habit of dwelling in spiders' webs—a view which is supported by the fact that the nymphs of more typical Nabids are often extremely myrmecoid.

Myrmecoidy of the nymph.—In the advanced nymph the contrasted black and white element in the coloration is only feebly represented by white markings on the sides of metathorax and base of abdomen, on a ground color which is predominantly reddish-brown, though the more strongly chitinised sclerites of the abdomen are almost black.

As indicated, however, by the figures, especially that of the profile, the nymph is extremely ant-like. The chief factor in this resemblance is the knob on the abdominal petiole. This is also a feature in the "mimicry" of ants by the nymph of *Nabis subcoleoptratus* as mentioned above. But the unexpected fact is that this structure is developed in a different manner in the two genera—in *Arachnocoris* by modification of one or more of the immediately post-basal abdominal segments; in *Nabis* by modification of the metanotum. Such achievement of a similar result by unlike methods brings the myrmecoidy of Nabidæ into line with that of other insect groups where the resemblance to ants is brought about in various ways; and may fairly be considered a strong argument against the view that the resemblance to ants is entirely accidental. It is nevertheless difficult to explain the myrmecoidy of *Arachnocoris* in terms of the mimicry hypothesis, of which one of the chief postulates is that the model must be plentiful in the situations frequented by the mimic; for *Arachnocoris* appears to be confined to one of the few stations which, in the forests of Panama, remain unfrequented by ants—namely, the interior of spiders' webs.

Habits of Arachnocoris.—The original observation of Pickard Cambridge that the members of this genus live *en famille* with colonies of spiders has been quoted and requoted by most sub-

sequent writers on these insects. The collections of spiders' webs in the angles between the buttresses of trees where the present species was taken hardly constitute colonies. Moreover in the webs of true colonial spiders at Panama, Dr. Banks was unable to find *Arachnocoris*.

Of most of the later described species no biological data have been recorded. The single known specimen of *A. (Velidia) berytoides* was collected "near shady bank of stream; beaten from mass of bush and decaying leaves." It is therefore uncertain whether or not it was in a spider web.

The specimens of *A. albomaculatus* on which this paper is based were collected in spiders' webs stretching between the buttresses on the bole of a large silk cotton tree (*Bombax ceiba*) near the Biological Station, Barro Colorado Island, Canal Zone. The webs were numerous and to a certain extent intermingled, so that it was by no means easy to ascribe them to the particular spider species, but Dr. Banks states that most were those of *Theridion forðum* Keyserling. More or less connected with the webs of this species were those of a *Uloborus*. Finally Dr. Wheeler has a specimen of the Gasteracanthid, *Acrosoma* sp. from the web of which was taken an *Arachnocoris* nymph and three adults. Mr. Banks noticed that all the bugs seen by him were in the *Theridion* webs, which not only predominated between the buttresses, but which would also be safer than the cribellate webs of the *Uloborus* or the sticky orb-webs of the *Acrosoma*.

It is remarkable that practically all the specimens were secured in webs between two buttresses only of this single tree. Although *Theridion forðum* webs were equally common on the boles of other trees of the same and different species, and were built also in other situations, no *Arachnocoris* were found elsewhere on the island.

Both observers noticed that the bugs hang upside down from the webs, a position for maintaining which their peculiar claws are eminently adapted. Such a position, habitually assumed, would also throw light on the strong convexity and heavy chitination of the gula (especially marked in the imago) and of the ventral surface of the abdomen. The latter is so marked in the

nymph (fig. 2) and the dorsal surface is so unusually feebly chitinised, that these two surfaces are almost as reversed in structure as they commonly are in space, when the insect hangs inverted from the web. A similar reversal of structure is said to occur in bats, as a result of their usually inverted resting position. Thus Kammerer (1924, p. 217) refers to "the remarkably inverted form of the stomach in bats, because the latter, when relaxing, hangs on with its feet, its head hanging downward" (sic).

The discovery that the nymphs also not only live in spiders' webs but are moreover modified rather profoundly for such an existence, indicates a probability that the whole life-history of *Arachnocoris* is spent in this peculiar situation and that the feeding-habits are commensal, but on these points more field observations will be necessary.

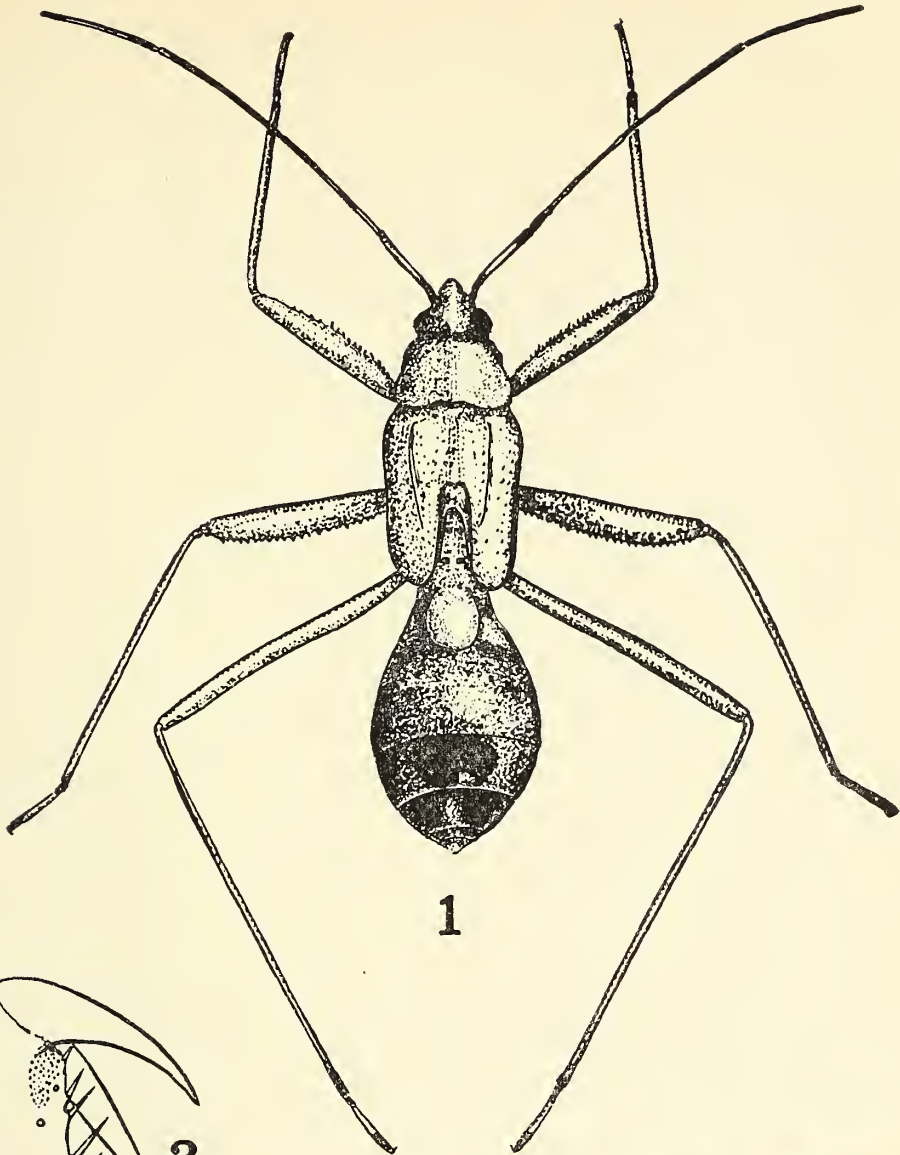
The only other case known to me of Heteroptera living in association with the webs of spiders is that of several species of thread-legged bugs, Reduviids of the subfamily Ploiariinae, which frequent corners of sheds, fences and similar situations where cobwebs accumulate. They perhaps feed on insects caught in the webs. Thus Downes, quoted by Parshley (1921, p. 17) writes of *Ploiaria canadensis* Parshl., "numerous this year on the under side of a rail on the shady side of a close board fence which separates my garden from the adjoining lot. Here they were found in all stages living among the cobwebs and apparently getting their living from the insects caught in them, though I never actually found one feeding." Another Reduviid of the same subfamily, *Ploiariola morstatti* Schum., lives inside the web-nests of the Psocid, *Archipsocus textor* End., and preys on these insects (Schumacher, 1917). The habit of *Arachnocoris*, however, of dwelling actually in a spider web remains unique among the Hemiptera. Dr. Wheeler has noticed that it is paralleled by the commensalism of the Tineid moth, *Batrachedra stegodyphobius* Walsingham, with South African social spiders of the genus *Stegodyphus* (Pocock, 1903).

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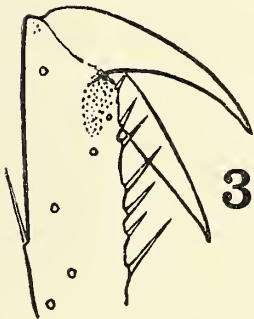
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EXPLANATION OF PLATE VI

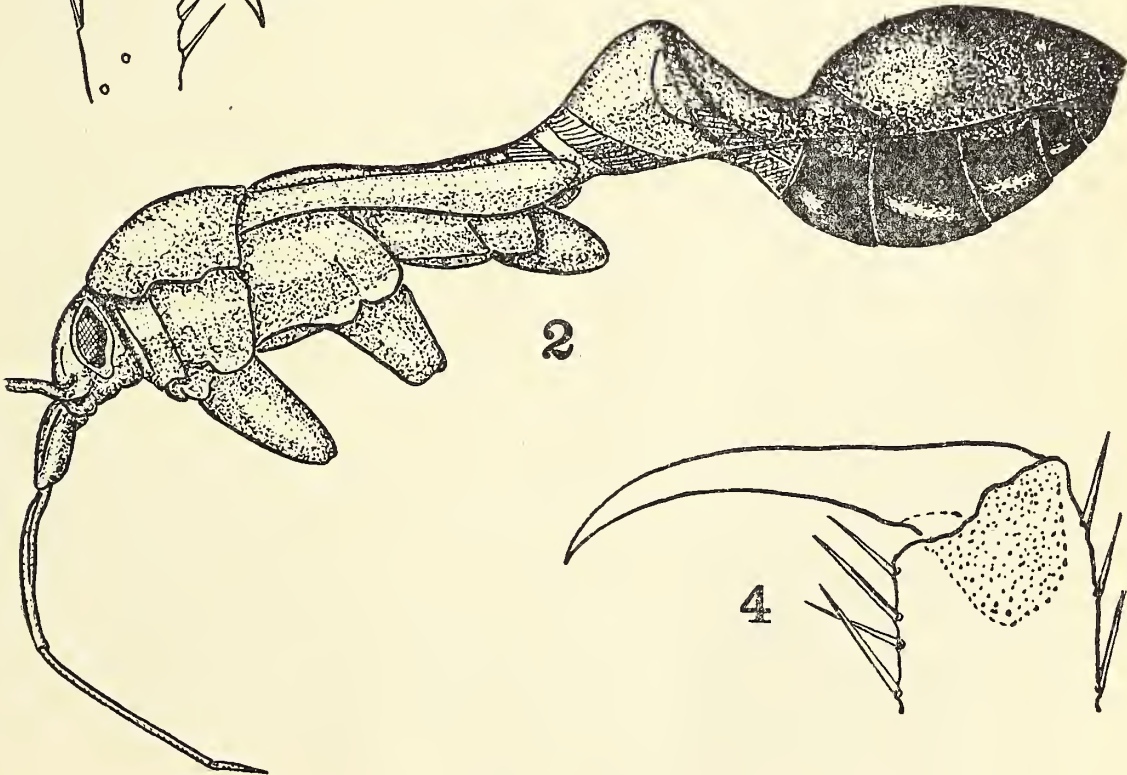
- 1-2. *Arachnocoris albomaculatus* Scott. Advanced nymph.
3. id. Imago. Apex of tarsus showing claws.
4. *Nabis capsiformis* Germ. Apex of tarsus showing one of the claws.



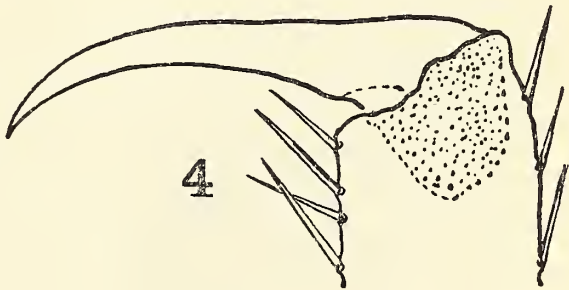
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NABIDAE

NORTH AMERICAN SPECIES OF THE SUBGENUS
SCOTOPHILELLA DUDA (DIPTERA,
BORBORIDAE)

BY ANTHONY SPULER
PULLMAN, WASHINGTON

(Continued from page 84)

Leptocera (*Scotophilella*) **niveipennis** Malloch.

Malloch: Proc. U. S. N. M. 44. 370 (1913). (*Limosina*.)
Porto Rico.

Leptocera (*Scotophilella*) **minima** Malloch.

Malloch: Tran. Am. Ent. Soc. 40. 16 (1914).
Costa Rica.

Leptocera (*Scotophilella*) **albifrons**, new species. (Fig. 22.)

Shining black. Front more than twice as broad as deep, with frontal triangle, to near frontal lunule, and vertex shining; lower portion of setigerous and divergent stripes silvery pollinose; bristles of head reduced; fronto-orbital bristles divergent, the lower smaller than the upper; interfrontal bristles in two pairs, the posterior pair weaker than the other, the anterior pair cruciate; face and cheeks grayish pollinose; face slightly carinate, concave in profile; clypeus narrowly visible from in front; cheek one-third as high as eye; buccal setulæ weak, two in number; antennæ with third joint but slightly larger than second; arista two times antennal length, with short pubescence. Mesonotum broad, disc convex; dorsocentral bristles in one pair; acrostichal setulæ few in number, reduced to four pairs between the dorsocentral bristles, pleural sutures reddish. Legs with coxæ, trochanters, apices of femora, tibiæ and tarsi piceous; middle femora with three anterior preapical setæ; middle tibiæ with four extensor bristles, two on apical-half and two on basal-third, and the usual flexor bristles; hind metatarsi two-thirds as long as second joint. Abdomen as long as thorax, broad, ovate in female and cylindrical in male; second segment longer than the next two. Wings slightly brownish; second section of costa glossy black; costa produced slightly beyond third vein, first section short ciliate, equal to second and two-thirds as long as third; basal section of third vein two-fifths as long as last section of second vein, and shorter than the penultimate section of fourth vein; outer crossvein one-half as long as distance between cross-

veins; last section of third vein gently curved up; fourth vein evanescent; outer angle of discal cell appendiculate. Halteres with fuscous stem and piceous knob. Length, 1.25–1.5 mm.

Type.—Male: Kendrick, Idaho. June 7, 1917 (Melander).

Paratypes.—Fifteen specimens distributed as follows: Washington: Vashon, Glenwood, Almota, Mt. Constitution, Omak, Clarkston (Melander). Idaho: Kendrick, Moscow (Melander). California: Yosemite Valley (Cresson). Illinois: (Ill. Univ.).

Leptocera (*Scotophilella*) **curtiventris** Stenh.

Stenhammar: Coprom. Sci. 365. (107) 3 (1855). (*Limosina*.)

Duda: Abhand. Zool-Botan. Ges. Wien. X. 1. III. (1918). (*Limosina*.)

Seven specimens, Washington: Vashon, Tulalip, Lake Crescent, Brinnon, Tacoma (Melander). Oregon: Viento (Melander).

Dr. Duda calls this species *L. mitchelli* Duda. However, specimens determined by Strobl as *L. curtiventris* Stenh. are not the same as those determined by Dr. Duda as *L. mitchelli*. The writer has therefore retained Strobl's determination.

Leptocera (*Scotophilella*) **dissimilicosta**, new species. (Fig. 16.)

Shining black. Front convex, one and one-half times as broad as deep, the two divergent stripes separated by the very narrow interfrontal stripes, opaque velvety black; setigerous stripes with some gray pollen; frontal triangle broad; bristles moderate; fronto-orbital bristles widely divergent, the upper directed backward, at least twice as long as the lower; orbital setulæ minute, not extending above fronto-orbital bristles; interfrontal bristles in three pairs, the middle pair longer than the other two but not cruciate; interfrontal setulæ in one pair, situated below and outward from, the lower interfrontal bristle; face grayish pollinose, concave in profile, slightly carinate; upper portion of face and carina between the antennæ reddish; clypeus narrowly visible from in front; cheek, at vibrissal angle, one-third as high as eye, grayish pollinose; bucca with an anterior bristle and two posterior setulæ; oral setulæ numerous, rather long at vibrissal angle; second joint of antennæ grayish pollinose; third joint two-thirds as long as broad, with whitish pubescence; arista two and one-half times antennal length, its pubescence short. Mesonotum convex, short, broad; dorsocentral bristles in two pairs, the anterior pair less than half as long as posterior; acrostichal setulæ arranged in eight irregular rows between the anterior pair of dorsocentral bristles; scutellum short triangular; marginal bristles four; pleuræ

semi-opaque, their sutures reddish; upper sternopleuræ with a posterior bristle and two anterior setæ. Front trochanter, middle and hind coxæ yellowish; tibiæ and tarsi fuscous; middle femora with five rather stiff preapical setæ on anterior side, middle tibiæ with two extensor bristles, one on basal third and one on apical third; hind tibiæ with no macrochaetæ; hind metatarsi one-half as long as second joint, both joints incrassate. Wings slightly smoked; veins brown, with second section of costa black; costa produced beyond third vein, first section setulose, with two basal bristles, second section three-fourths as long as third; basal section of third vein one-third as long as last section of second vein and two-thirds as long as distance between crossveins; outer crossvein nearly one-half as long as second section of fourth vein; third vein slightly curved up beyond middle of last section, ending a little before wing-tip; fourth vein evanescent; discal cell long, rather narrow; fifth vein produced a short distance beyond outer crossvein. Abdomen tapering posteriorly, bare or nearly so; second segment one and one-half times as long as third. Halteres black. Length, 2.75 mm.

Type.—Female: Olga, Wash. June 17, 1910 (Melander).

Paratypes.—Nine specimens from: Washington: Dewatto, Mt. Constitution, Tacoma, Olga (Melander). Idaho: Moscow Mt. (Melander).

Leptocera (*Scotophilella*) **rotundipennis** Malloch.

Malloch: Proc. U. S. N. M. 44. 370 (1913). (*Limosina*.)
Porto Rico.

Leptocera (*Scotophilella*) **elegans**, new species. (Fig. 17.)

Subshining black. Front convex, two-thirds as broad as deep, upper portion opaque black, with the setigerous stripes slightly shining; lower front reddish; bristles shining black; fronto-orbital bristles nearly equal in size; orbital setulæ weak, not extending above the upper fronto-orbital bristles; interfrontal bristles reduced, in five pairs, the anterior two pairs cruciate; interfrontal setulæ in one pair, located on lower margin of front midway between the interfrontal stripes and the orbital stripes; face dark fuscous to piceous, shining, shallowly concave in profile; carina but little developed between the antennæ; clypeus narrowly visible from in front; cheeks dusky yellow, browned anteriorly, one-third as high as eye when measured at vibrissal angle; buccæ with three weak setæ, oral setulæ distinct; antennæ reddish; third joint oval, with short whitish pubescence; arista two and one-half times antennal length, with microscopic pubescence. Mesonotum and scutellum lightly cinereous opaque; lateral margins of notum reddish; dorsocentral bristles in four pairs, the posterior pair strong, the anterior

two pairs very much reduced and somewhat indistinct; acrostichal setulæ short, arranged in eight rows between the anterior pair and four rows between the posterior pair of dorsocentral bristles; posterior pair of middle acrostichals much longer than the others; scutellum trapezoidal; marginal bristles four, the anterior two shorter than the others; pleuræ piceous with its sutures reddish to yellow. Legs pale brown with all coxæ and trochanters yellow; front femora with a row of short stiff bristles on outer surface; middle trochanter with a short bristle; middle femora with two stiff anterior preapical setæ; middle tibiæ with three extensor, one on basal third and two on apical fourth and the usual flexor bristles; hind metatarsi two-thirds as long as second joint. Wings hyaline; costa black, first section short ciliate, equal to second and one and one-fourth times as long as third; penultimate sections of third vein longer than penultimate section of fourth, two-fifths as long as last section of second vein and one and one-third times as long as outer crossvein; last section of third vein straight and ending near wing-tip; fourth vein not reaching wing-margin; outer angle of discal cell very short appendiculate. Abdomen as long as thorax; dorsum with few hairs; posterior margin of dorsal segments pale brown; segments equal or nearly so. Halteres pale brown to yellow. Length, 2 mm.

Type.—Female: Bermuda Islands. June 28, 1905 (Kincaid).

Paratypes.—Six specimens, located as follows: Oregon: Forest Grove (Cole). Iowa: Ames. Illinois: (Ill. Univ.). Washington, D. C. (Coquillett).

Leptocera (*Scotophilella*) **curtipennis**, new species. (Fig. 5.)

Subshining black. Front two times as broad as deep, with the two divergent stripes, divided by the interfrontal stripes, velvety black; lower front slightly reddish; bristles of vertex and occiput moderately strong; fronto-orbital setulæ not extending above the upper fronto-orbital bristle, microscopic; interfrontal bristles in three pairs, the upper not reaching the median line, the middle long and cruciate, the lower very weak, hair-like; interfrontal setulæ in two pairs, in divergent rows below the anterior pair of interfrontal bristles; ocelli white; face concave in profile; clypeus broadly visible from in front; cheek, at vibrissal angle, one-fourth as high as eye; vibrissæ long; buccal setulæ in two pairs, hair-like; oral setulæ distinct; antennæ diverging, third joint as long as second and one and one-half times as broad as long; arista three times antennal length, with short pubescence. Mesonotum with two pairs of dorsocentral bristles; acrostichal setulæ arranged in six definite rows between the anterior pair of dorsocentral bristles; scutellum small, triangular, marginal bristles four; pleural sutures brown; lower sternopleuræ fuscous; middle femora with three preapical bristles on anterior side, the one nearest apex, bristle-like; middle tibiæ with four pairs

of extensor bristles, two on basal and two on apical third, hind metatarsi two-thirds as long as second joint. Wings short and blunt, not reaching much beyond tip of abdomen, slightly browned; veins brown; costa ending at third vein, first section setulose, equal to second and two-thirds as long as third; penultimate sections of third and fourth veins subequal, two times as long as outer crossvein and two-fifths as long as last section of second vein; third vein straight on last section and ending near wing-tip; fourth vein not reaching wing margin; fifth vein produced a short distance beyond outer crossvein. Abdomen cylindrical, hairy, as long as thorax; second segment two-thirds as long as third. Halteres yellow. Length, 2 mm.

Type.—Male: Tacoma, Wash. May, 1912 (Melander).

Paratypes.—Eight specimens from Tacoma, Wash. (Melander).

Leptocera (*Scotophilella*) **rectangularis** Malloch.

Malloch: Tran. Am. Ent. Soc. 40. 19 (1914).
Costa Rica.

Leptocera (*Scotophilella*) **regularis** Malloch.

Malloch: Tran. Am. Ent. Soc. 40. 19 (1914).
Costa Rica.

Leptocera (*Scotophilella*) **pumila** Williston.

Williston: Tran. Ent. Soc. Lond. 432 (1896). (*Limosina*).
St. Vincent, W. I.

Leptocera (*Scotophilella*) **Aldrichi** Williston.

Williston: U. S. Dept. Agr. Div. Ornithol. Mammal., Bul. 7, 259
(1893). (*Limosina*).
Described from Argus Mts., California.

Leptocera (*Scotophilella*) **abundans**, new species. (Fig. 14.)

Shining black. Front convex, lower portion reddish; divergent stripes velvety black; bristles of head moderately long; fronto-orbital bristles not very strong, divergent, the upper but little longer than the lower; fronto-orbital setulae weak and not extending above the upper fronto-orbital bristles; interfrontal bristles in four pairs decreasing in size anteriorly, not cruciate; interfrontal setulae weak, in two pairs, one on each side of interfrontal rows; face and cheeks slightly gray dusted; cheeks, at narrowest

point, two-fifths as high as eye; vibrissæ long; oral setulæ long, hair-like, bucca setæ in three pairs, bristle-like, increasing in size toward vibrissal angle; face concave in profile, anterior margin of epistome somewhat curved up; clypeus broadly visible from above, carina but slightly developed except between antennæ; antennæ divergent, third joint oval; arista long, three times antennal length, with short and rather dense pubescence. Mesonotum irregular, short hairy, convex, rather broad; dorsocentral bristles in two pairs, the posterior pair much longer than the anterior two; acrostichal setulæ arranged in eight irregular rows between anterior pair of dorso-centrals, the posterior middle pair much longer than the others, bristle-like; scutellum rather large, triangular, disc opaque, rather flat, margin with four bristles and two small setæ at base; pleuræ opaque piceous, sutures reddish; upper sternopleuræ with two bristles, the anterior one-half as long as the posterior. Legs piceous to black, short hairy; middle trochanter with a small bristle; middle femora with a series of four short stiff setæ on the apical fourth of the anterior side; middle tibiæ with the usual flexor bristles, and six extensor bristles, one small, near base, one on basal third, one on basal two-fifths, two on apical third and one near apex; hind metatarsi incrassate, two-thirds as long as second joint. Wings dusky; veins brown; costa ending at third vein, first section setulose, equal to third and two-thirds as long as second; basal section of third vein, two-fifths as long as last section of second vein, equal to distance between crossveins and twice as long as outer crossvein; last section of third vein straight, ending near wing-tip; last section of fourth vein faintly traceable from outer crossvein to wing-margin; discal cell short appendiculate. Abdomen as long as thorax, second and third segments nearly equal. Halteres fuscous. Length, 1.5 mm.

Type.—Female: Moscow, Idaho, June 1, 1917 (Melander).

Paratypes.—Eighty-three specimens from the following localities: Washington: Mt. Rainier, Omak, Glenwood, Vashon, Quilcene, Pullman, Palouse, Walla Walla, Kamiac Butte, Bellingham, Tacoma, Kettle Falls, Seattle, Oroville, Ephrata, Friday Harbor, Mt. Constitution (Melander). Idaho: Moscow, Craig Mts., Troy, Pottsville (Melander). Oregon: Eagle Creek, Portland (Melander). Montana: Lake McDonald, Glacier National Park (Melander). California: Berkeley Hills (Cresson); Fieldbrook (Barber). New Mexico: Alamogordo (Cresson). Pennsylvania: Swarthmore, Del. Co. (Cresson). British Columbia: Kaslo (Currie).

Leptocera (*Scotophilella*) *levigena*, new species. (Fig. 7.)

Shining black. Front convex, the two divergent stripes, divided by the narrow interfrontal stripes, velvety black; bristles of vertex and occiput

strong; interfrontal bristles in four pairs, increasing in size anteriorly, the anterior pair cruciate; interfrontal setulæ minute; fronto-orbital bristles directed outward, the lower much weaker than the upper; orbital setulæ weak; face and cheeks gray-dusted; face carinate, slightly concave in profile; clypeus broadly visible from in front; cheek from mouth margin to lower margin of eye, one-third as high as eye; buccal setulæ in two pairs, the anterior one bristle-like; oral setulæ increasing in size toward vibrissal angle, the one nearest vibrissæ, bristle-like; third joint of antennæ with whitish pubescence; arista two and one-half times antennal length, its pubescence microscopic. Dorsocentral bristles present in two pairs, the posterior pair considerably longer than the other, acrostichal setulæ short, numerous, arranged in eight rows between the anterior pair of dorsocentral bristles; scutellum large, triangular; marginal bristles four; pleural sutures reddish; upper sternopleuræ with a single posterior bristle. Legs long, hairy; middle femora with a row of six preapical anterior bristles which increase in size apically; middle tibiæ with seven extensor, two pairs on basal third and three bristles on apical third; hind metatarsi but little thickened, two-thirds as long as next joint. Wings elongated, somewhat pointed; costa ending at third vein, first section three-fourths as long as second, second equal to third; last section of second vein nearly three times basal section of third vein, last section of third vein curved forward, then backward and again forward to wing margin, ending near wing-tip; fourth vein traceable to wing-margin; fifth vein produced a short distance beyond outer crossvein. Abdomen as long as thorax, hairy; second segment slightly longer than third. Length, 2.25–2.5 mm.

Type.—Female: Cold Spring Harbor, New York. July (Melander).

Paratypes.—Seventeen specimens, distributed as follows: Washington: Clarkston, Valleyford, Wawawai, Lake Crescent, Pullman (Melander). Idaho: Moscow Mts., Craig Mts., Lake Waha (Melander). Oregon: Hood River (Melander). Montana: Thompson (Melander). California: Shasta Springs (Melander). New York: Cold Spring Harbor (Melander).

Leptocera (*Scotophilella*) **carinata**, new species. (Fig. 1.)

Subshining piceous. Front twice as broad as deep; lower front slightly browned; divergent stripes opaque black; bristles of front and vertex prominent; lower fronto-orbital bristle slightly smaller than the upper; orbital setulæ weak; interfrontal bristles in five pairs, the upper and lower pairs reduced, the remaining three pairs long and cruciate; face and cheeks brown; face carinate, slightly concave in profile; clypeus narrowly visible from in front; cheeks, at vibrissal angle, a little less than one-third as high as eye; vibrissæ strong; buccæ with three rather small setæ; oral setulæ

weak; antennæ widely divergent, third joint twice as broad as long, with minute whitish pubescence; eyes large. Mesonotum broad, lateral margins brown, disc convex; dorsocentral bristles in two pairs; acrostichal setulæ short, numerous, arranged in about eight irregular rows; scutellum opaque, triangular; marginal bristles four; pleural sutures yellowish, upper sternopleuræ with two bristles, the anterior bristles much smaller than the other. Legs brown, with coxæ and trochanters lighter; front femora with a single outwardly projecting bristle on upper surface; middle femora with five anterior and a single posterior preapical bristles, hind tibiæ without macrochaetæ, hind metatarsi not thickened, two-thirds as long as the next joint. Wings yellowish; costa brown, other veins pale brown; costa ending at third vein, all sections subequal in length, basal section of third vein a little less than one-half as long as last section of second vein and a little longer than the second section of fourth vein; outer crossvein at twice its own length from inner; last section of third vein straight or but slightly curved up and ending near wing-tip; fourth vein traceable to wing-margin; discal cell rather broad, its outer angle short appendiculate. Abdomen with posterior margins yellow; lateral margins with rather uniform hairs. Halteres whitish. Length, 2–2.5 mm.

Type.—Female: Illinois (Melander).

Paratypes.—Two specimens, from Brookings, S. D. (Johnson); Beverly, Mass. (Melander).

Leptocera (*Scotophilella*) **gibba**, new species. (Fig. 8)

Cinereo-opaque black. Front as broad as long, slightly grayish pollinose except on divergent stripes; interfrontal bristles in three pairs; antennæ reddish brown; third joint broader than long; arista a little more than two times antennal length, with long pubescence; face broadly carinate, slightly concave in profile; clypeus narrowly visible from in front; lower margin of epistome not curved up; cheeks slightly gray-dusted, one-third as high as eye. Mesonotum with disc decidedly convex; dorsocentral bristles in three pairs; scutellum triangular; margin with four bristles; pleural sutures yellowish, sternopleuræ with a single bristle. Legs browned, hairy; front tarsal joints depressed; middle femora with a row of five short stiff setæ at base; middle tibiæ with the usual bristles; hind tibiæ thickened apically; first two joints of hind tarsi distinctly thickened; hind metatarsi but little more than one-half as long as second joint. Abdomen cylindrical, shorter than thorax; second segment but little longer than third; hypopygium not large. Halteres yellow. Wings hyaline, veins brown; costa not extending beyond third vein, second section distinctly longer than third; second section of fourth vein shorter than basal section of third; discal cell short; last section of third vein slightly bent up beyond middle. Length, 2 mm.

Type.—Male: Battersea, Jamaica. Feb., 1910 (R. Thaxter).

Paratypes.—Two specimens from the same locality.

The specimens were preserved in alcohol and had lost most of their original color as well as some of their bristles.

Leptocera (*Scotophilella*) **rara**, new species. (Fig. 3.)

Subshining black. Front broader than long, shining, with the divergent stripes velvety black; bristles of head moderately long; interfrontal bristles in four pairs, the anterior pair considerably reduced; antennæ divergent, slightly browned; arista a little more than twice the antennal length, with distinct pubescence; face dark fuscous, deeply concave in profile; epistome slightly curved up, carina developed between the antennæ only; eyes rather large; cheeks slightly gray-dusted, one-third as high as eye at vibrissal angle. Mesonotum shining black with eight rows of short acrostichal setulæ between the anterior pair of dorsocentral bristles; dorsocentral bristles in two pairs, the anterior pair considerably smaller than the posterior; scutellum opaque, with four marginal bristles. Legs short hairy; middle femora with a single anterior preapical bristle; middle tibiæ with the usual bristles rather weak; hind metatarsi thickened, two-thirds as long as the second joint. Abdomen rather broad, with the second segment nearly twice as long as the third. Wings slightly browned; costa black, ending at wing-tip, all sections very nearly equal, with the third very slightly longer; veins pale brown; third vein straight, ending much before wing-tip; discal cell short and broad; outer crossvein twice as long as the second section of fourth vein and two-thirds as long as basal section of third vein. Halteres dark fuscous. Length, 1.5 mm.

Holotype.—Male: Berkeley, Cal. (Cresson).

This species is easily distinguished from all the other species of this subgenus by the wide discal cell and the short distance between the crossveins.

Leptocera (*Scotophilella*) **quadrissetosa** Malloch.

Malloch: Tran. Am. Ent. Soc. 40. 18 (1914).

Costa Rica.

Leptocera (*Scotophilella*) **bisecta** Malloch.

Malloch: Tran. Am. Ent. Soc. 40. 20 (1914).

Costa Rica.

Leptocera (*Scotophilella*) **longicosta**, new species. (Fig. 26.)

Opaque black. Front slightly convex, one and one-half times as broad as deep, gray dusted, with the setigerous stripes and frontal triangle slightly

shining; bristles of the head prominent; fronto-orbital setulæ very weak; interfrontal bristles in three pairs, the posterior and anterior pairs quite weak, the middle pair long and cruciate; interfrontal setulæ, weak, in one pair; antennæ moderate in size; third joint oval, one and one-half times as broad as long, with whitish pubescence; arista three times antennal length, short pubescent; face dark fuscous to piceous with gray pollen, deeply concave in profile; clypeus broadly visible from in front; cheeks gray dusted, one-third as high as eye; buccal setulæ present, five in number, upturned, anterior two longer than the others and one-half as long as the vibrissæ. Mesonotum with two pairs of dorsocentral bristles, the anterior pair much weaker than the posterior; acrostichal setulæ weak, arranged in six rows between the posterior pair; posterior pair of middle acrostichals, long, almost as long as the anterior pair of dorsocentrals; scutellum quadrangular disc flat; marginal bristles four; pleural sutures reddish, sternopleuræ subshining. Abdomen cylindrical, lateral margins with long hairs; second segment elongated, one and two-thirds times as long as third; hypopygium shining black. Legs with coxa, trochanters, apices of femora, tibiæ and tarsi fuscous. Front femora with a row of long hairs on ventral side; middle femora with two preapical anterior bristles; hind tibiæ without bristles; hind metatarsi thickened, one-half as long as next joint. Wings brownish; veins brown; costa produced beyond third vein, first section costa short and ciliate, three-fourths as long as second, second equal to third; last section of second vein two and one-half times as long as basal section of third vein; section of fourth vein between crossveins slightly longer than outer crossvein and three-fourths as long as basal section of third vein, last section of third vein bent up at inner crossvein and ending before wing-tip; marginal cell narrow; fourth vein traceable to wing-margin; fifth vein ending abruptly at a distance equal to outer crossvein from outer crossvein. Halteres with yellow stem and fuscous knob. Length, 1.25–1.5 mm.

Type.—Male: Valleyford, Wash., July 14, 1918 (Melander).

Paratypes.—One hundred twenty-five specimens from the following localities: Washington: Valleyford, Leavenworth, Lacey, Glenwood, Tacoma, Pullman, Bellingham, Almota, Wawawai, Clarkston, Mt. Constitution, Palouse, Seattle, Friday Harbor, Omak, Centralia, Adna, Vancouver (Melander). Idaho: Moscow, Priest Lake, Potlatch, Collins, Avon, Chatcolet (Melander); Troy (Cresson). British Columbia: Kaslo (Currie). California: Redwood Canyon, Berkeley Hills, Yosemite Valley (Cresson). New Hampshire: Mt. Washington (U. S. N. M.). Pennsylvania: Swarthmore (Cresson). Illinois: (Ill. Univ.). New York: Cold Spring Harbor (Melander).

Leptocera (*Scotophilella*) **crassimana** Haliday. (Fig. 2.)Haliday: Ent. Mag. III. 328. (1836). (*Limosina*.)Duda: Abhand. Zool-Botan. Ges. Wien. X. I. 167 (1918). (*Limosina*.)

This is a very common species and has a wide distribution. It is easily distinguished by its depressed front and hind tarsal joint. Two hundred and eighty-five specimens have been examined from the following localities: Washington: Index, Almota, Friday Harbor, Bellingham, Winlock, South Bend, Yakima, Pt. Gamble, Brinnon, Vashon, Adna, Lake Cushman, Shelton, Blaine, Montesano, Mt. Constitution, Monroe, Lynden, Arlington, Nooksack, Olga, Wawawai, Kamiac, Pullman, Spokane, Tacoma, Lake Crescent, Woodland (Melander); Ilwaco (Spuler); Guemes Isl. (Aldrich). Idaho: Potlatch, Priest Lake, Chatcolet, Moscow, Lewiston (Melander). Oregon: Portland, Viento, Forest Grove (Melander). Montana: Lake McDonald, Flathead Lake (Melander). California: Mill Valley (Aldrich); Muir Woods, San Francisco (Melander); Fieldbrook (Barber). British Columbia: Langley, New Westminster (Melander); Kaslo (Currie). Alaska: Popoff Isl. (Kincaid), Douglass (Jenne). Illinois: Chicago (Melander). Vermont: Lynden (Melander).

Leptocera (*Scotophilella*) **sylvatica** Meigen.Meigen: S. B. VI. 27. (1830). (*Borborous*.)Duda: Abhand. Zool-Botan. Ges. Wien. XI. 105 (1918). (*Limosina*.)*Mycetia claripennis* Robineau-Desvoidy: Myod. 806 (1830).

This European species of *Scotophilella* is reported from Arlington, Virginia, by Frederick Knab. (Insecutor Inscitiae Menstruus, IV. 3 (1916).

Leptocera (*Scotophilella*) **luctuosa**, new species. (Fig. 2.)

Black subshining. Front two-thirds as broad as deep, gray pollinose, the divergent stripes darker; fronto-orbital bristles divergent, directed outward, the lower one-half as long as the upper; orbital setulæ present, weak, not extending above the upper fronto-orbital bristle; interfrontal bristles in three pairs, the posterior pair slightly weaker than the anterior two, the

anterior two pairs cruciate; antennæ divergent; arista two times antennal length, microscopically pubescent; face shining black, yellow between antennæ, cheek from mouth margin to lower margin of eye, one-fourth as high as eye; bucca with three setæ, the anterior one bristle-like; oral setulæ hair-like. Mesonotum with two pairs of dorsocentral bristles, the anterior pair very much weaker than the other; acrostichal setulæ short, arranged in eight rows between the anterior pair of dorsocentral bristles; scutellum quadrangular; marginal bristles four; lower pleuræ gray-dusted; sternopleuræ with a posterior bristle and anterior setæ. Legs with trochanters, knees, and tarsi piceous; front coxæ silvery pollinose; middle tibiæ with three bristles on extensor surface, one on basal half and two on apical third; hind metatarsi two-thirds as long as next joint. Wings browned; second section of costa black, other veins piceous; costa ending at third vein, first section short ciliate with two basal bristles, three-fourths as long as second, second equal to third; last section of second vein two and one-half times as long as basal section of third vein; distance between crossveins equal to basal section of third vein and two times outer crossvein, last section of fourth vein slightly bent forward on basal third; fourth vein evanescent; fifth vein produced a little beyond outer crossvein; discal cell broad. Abdomen shining black, longer than thorax, ovate, dorsum flattened; segments equal. Halteres piceous. Length, 2-2.25 mm.

Type.—Female: Pullman, Wash., April 10, 1908 (Melanders).

Paratypes.—Eight specimens from Pullman, Wash.; Moscow and Lake Waha, Idaho (Melanders).

Leptocera (*Scotophilella*) **nigrifrons**, new species. (Fig. 25.)

Black subshining. Front broader than long with the divergent stripes, divided by the narrow interfrontal stripes, opaque; setigerous stripes ridged; bristles of head prominent; fronto-orbital bristles extended backward and outward over eye; orbital setulæ weak, the upper two pairs somewhat stronger; interfrontal bristles strong, in three pairs, the middle pair much stronger than the others, middle pair cruciate; interfrontal setulæ in two pairs, located laterally; cheeks brown, changing to black toward occiput, narrow, distance from lower margin of eye to oral margin, one-fifth as high as eye; face brown, concave in profile; epistome slightly projecting upward; clypeus broadly visible from above; carina slightly developed between the antennæ only; antennæ piceous; third joint oval and covered with a whitish pubescence; arista three times antennal length, its pubescence short and dense. Mesonotum with two pairs of dorsocentral bristles, the posterior pair twice as long as the anterior; acrostichal setulæ arranged in eight rows between the anterior pair and in six rows between the posterior pair of dorsocentral bristles; scutellum triangular; marginal bristles four, the posterior pair much longer than the anterior; pleuræ piceous, sutures lighter,

sternopleuræ with a single bristle. Legs piceous, hairy; middle femora with a row of setulæ on the anterior side, the one nearest the apex bristle-like; middle tibiæ with the usual flexor bristles, and six extensor bristles arranged as follows: one pair at basal third, one pair at apical third, and one pair, strong, at near apex; hind metatarsi depressed, three-fifths as long as the second joint. Knob of halteres piceous, stem yellow. Wings infusate; veins brown; costa ending at third vein, first section shorter than the second, third section nearly as long as second; last section of second vein two and one-half times as long as basal section of third vein; basal section of third vein equal to second section of fourth and less than two times as long as outer crossvein; last section of third vein ending near wing-tip; last section of fourth vein traceable to wing-margin; fifth vein extending slightly beyond outer crossvein. Abdomen short, cylindrical; second segment one and one-fourth times as long as third; hypopygium large. Length, 1.5–2 mm.

Type.—Male: Seattle, Wash. (Melander).

Paratypes.—Twenty specimens distributed as follows: Washington: Seattle, Olga, Husum, Lilliwaup, Dewatto, Vashon, Pullman, Deer Park (Melander); Ilwaco (Spuler). Idaho: Glengary, Moscow Mt. (Melander). Oregon: Newport, Hood River (Melander). California: Berkeley Hills (Cresson).

Leptocera (*Scotophilella*) **ordinaria**, new species. (Fig. 19.)

Shining black. Front with setigerous stripes and frontal triangle gray-dusted, the two divergent stripes divided by the narrow interfrontal stripes, velvety black; lower front reddish; interfrontal bristles in three pairs, the posterior pair weaker than the other two, the anterior two pairs curciate; interfrontal setulæ in two pairs, extending along lower frontal margin; lower fronto-orbital bristle weaker than the upper; orbital setulæ microscopic, not extending above the upper fronto-orbital bristles; antennæ divergent; third joint oval with a whitish pubescence, one and one-half times as long as second; arista thread-like, two and one-half times antennal length, its pubescence short; face and cheeks piceous; face concave in profile, carina produced between the antennæ only; epistome but slightly curved up at its anterior margin; clypeus narrowly visible from in front; cheeks, from vibrissal angle to lower margin of eye, one-fifth as high as eye; buccal setæ two in number, upcurved, the anterior seta stronger than the other. Mesonotum broad, disc convex, with acrostichal hairs short, arranged in eight to ten rows between the anterior pair of dorsocentral bristles, the posterior pair of middle acrostichals long; two pairs of dorsocentral bristles present, the anterior pair weaker; scutellum triangular, disc flat; marginal bristles four, the posterior pair very long, longer than the anterior pair; pleuræ sutures yellow. Legs with coxæ, trochanters, tarsi of front and middle tibiæ and bases of hind tibiæ piceous; front femora slightly swollen, with two extensor

and four flexor bristles on the apical half; middle femora with three anterior preapical bristles, increasing in size apically; middle tibiae with a weak flexor bristle on apical third in addition to the usual apical bristle and five extensor, two on basal half and three on apical third; hind metatarsi thickened, two-thirds as long as second joint. Wings with costal sections subequal or nearly so, first section short ciliate with two basal bristles; costa ending at third vein; basal section of third vein two-fifths as long as last section of second vein and slightly longer than penultimate section of fourth vein; distance between crossveins two times as long as outer crossvein; last section of third vein straight; fourth vein traceable to wing-margin; fifth vein ending abruptly a short distance beyond outer crossvein. Abdomen cylindrical in male, broader in female, almost bare; second segment one and one-half times third, hypopygium prominent. Length, 1.5-2 mm.

Type.—Male: Collins, Idaho (Melandner).

Paratypes.—Thirty-four specimens, distributed as follows: Washington: Adna, Lynden, Mt. Constitution, Kamiac Butte, Dewatto, Olga, Bickleton, Kettle Falls (Melandner). Idaho: Chatcolet, Collins, Moscow Mts., Potlatch, Lewiston, Avon (Melandner). British Columbia: Kaslo (Currie). California: Muir Woods (Melandner). Montana: Saltese (Melandner). New Mexico: Alamogordo (Cresson). New Hampshire: Franconia (Mrs. Slosson). Illinois: (U. S. N. M.).

Leptocera (*Scotophilella*) **evanescens** Tucker. (Fig. 15.)

Kans. Univ. Sci. Bul. IV. 102 (1907). (*Limosina*.)

Douglas Co., Kansas, and Brookings, South Dakota.

The following notes are made from two type specimens labeled Brookings, South Dakota, kindly furnished by Dr. Snow:

Lower front, face and cheeks lightly reddish; face broadly tuberculate between antennæ, deeply excavated beneath tubercle; anterior margin of epistome curved up; clypeus broadly visible from in front; interfrontal bristles in three pairs, the anterior pair cruciate. Mesonotum with two pairs of dorsocentral bristles; acrostichal setulæ in nine rows between the anterior pair of dorsocentral bristles.

This species can most readily be distinguished by the slight reddish coloring of lower front, face and cheeks, by the excavated face with the broad tubercle between the antenna, the curved up lower margin of the epistome and by the rather broad wings.

There is another specimen from Brookings, South Dakota, apparently a cotype as it is mounted and labeled like those belonging to the Kansas Museum. This was collected by Dr. Aldrich who should be credited with securing the type material.

Numerous specimens from the following localities: Washington: Pullman (Melander). Montana: Three Forks (Melander). Texas: Cotulla (Pratt). Kansas: McPherson (Knaus). Indiana: Lafayette (Melander). Illinois: (Ill. Univ.); Chicago (Melander). Ohio: Columbus (Atwood). New York: Cold Spring Harbor (Melander). Pennsylvania: (Cresson).

Leptocera (*Scotophilella*) **occidentalis** Adams. (Fig. 4.)

Kansas Univ. Sci. Bul. II. 4555 (1904). (*Limosina*.)

Palo Alto, California.

Through the courtesy of the University of Kansas the writer has been able to make a study of the type specimen and notes the following additions to Adams' description:

Interfrontal bristles in three pairs, the middle pair much longer than the others and cruciate; cheeks at vibrissal angle, two-fifths as high as eye. Mesonotum with two pairs of dorsocentral bristles; acrostichal setulae very numerous, short, not arranged in definite rows; scutellum with four marginal bristles. Middle tibiae with five extensor and one flexor bristle in addition to the usual apical bristles; first two joints of hind tarsi a little thickened, first joint two-thirds as long as second. Costa ending at third vein; penultimate sections of third and fourth veins subequal and twice as long as outer crossvein; outer angle of discal cell very short appendiculate. Abdomen short, cylindrical, lateral margins with long hairs; hypopygium large.

Two female species from Claremont, Cal., undoubtedly belong to this species but have the second and third costa divisions equal. In the type specimen the third costal division is so little longer than the second that these structures have been regarded as a variation within the species.

Two specimens from Claremont, California (Baker). (Melander Collection.)

? *Limosina transversalis* Malloch.

Malloch: Report Canadian Arctic Expedition, 1913-18. V. 111 (1919).

Malloch's description of this species gives the following characters: arista very short, thickened at the base and distinctly tapering; vibrissae weak; genal bristle absent; legs slender, without any distinct bristles, even on femora; hind tarsi with basal joint twice as long as second. The wings venation differs from that of other species of this genus in that it has the two crossveins close together and almost directly beneath the termination of the first vein.

These characters are so strikingly different from those commonly found in this group that the writer cannot believe it to be a Borborid. It certainly does not belong to the genus *Lep-tocera*. The species may possibly belong to the *Oscinidæ*.

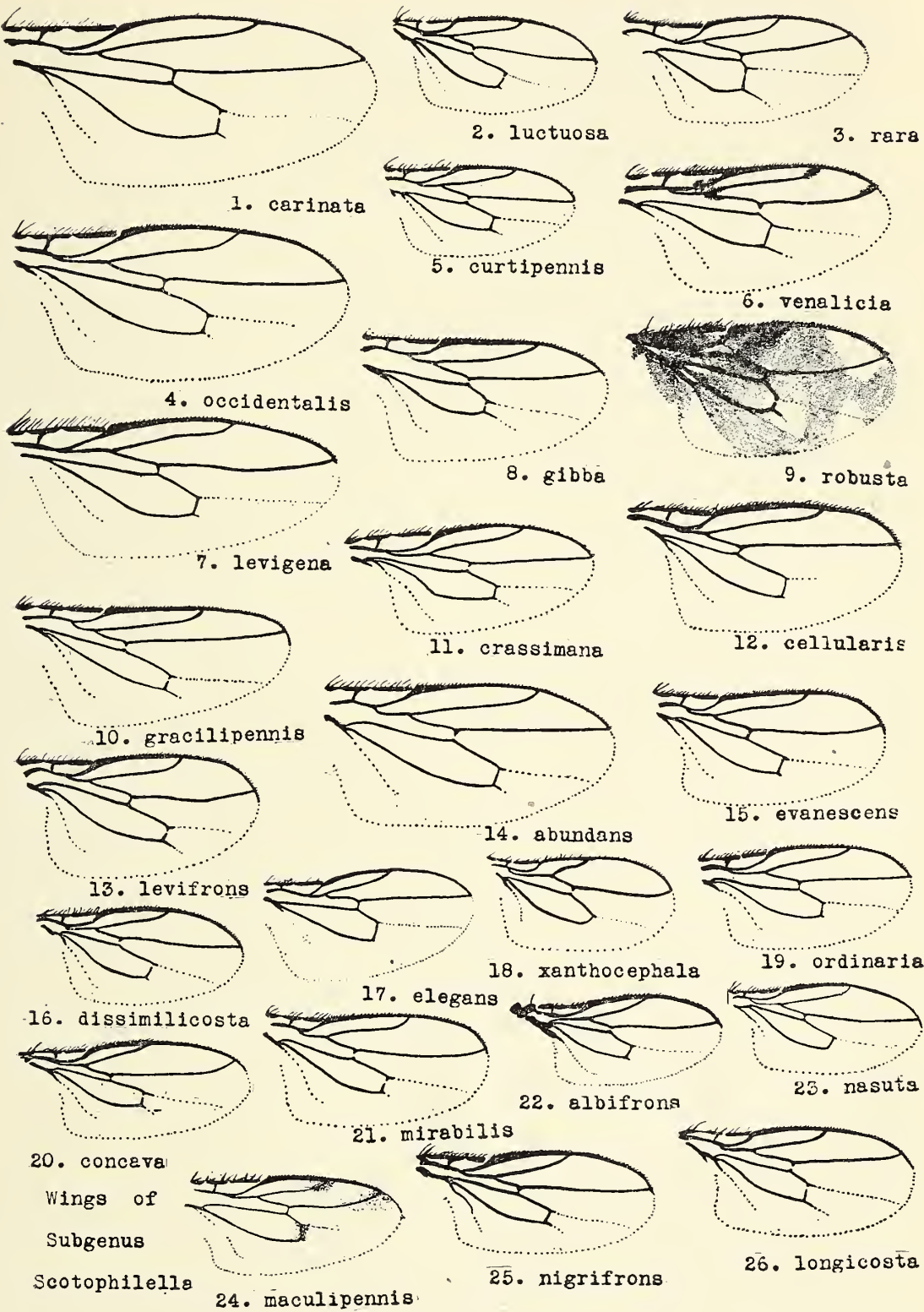
BOOK REVIEW

Anatomy and Physiology of the Honeybee, by R. E. Snodgrass. McGraw-Hill Book Co., N. Y. \$3.50.

The most written-about insect in the world is the subject of this, a new book that is not only interesting and of great educational value but that is not a duplicate of anything previously published. It reminds one of such classics as Lowne's "Blow-fly" and Miall and Denny's "Cockroach," to say nothing of more recent books on other insects, but the honey-bee has the advantage of exceedingly interesting habits and of being an insect that people like.

The publishers seem justified in saying that it is "an authoritative text on the anatomy, physiology and behavior of the honey-bee. Because of the broad plan of the book, which considers the anatomy of the honey-bee as an adaptation of general insect structure to the special needs of the bee, the book should be of interest to all students of insect life."

Prospective bee-keepers should be warned that this is not a manual on the culture of bees and experienced apiarists may be assured that it contains much of interest that is not to be found in such manuals.—FRANK E. LUTZ.



SCOTOPHILELLA

RELATION BETWEEN TEMPERATURE, HUMIDITY AND ACTIVITY OF HOUSE MOSQUITOES*

BY WILLEM RUDOLFS

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A search of the literature reveals the fact that comparatively little is known of the behavior of adult mosquitoes under atmospheric conditions. There are, however, a number of observations published on the relation between the behavior in general of adult insects and temperature, humidity, light, etc. A few publications which have bearing on the subject under discussion will be cited for comparison.

Headlee (3) discussing external factors which influence the flight of mosquitoes states: "Without doubt, low temperature reduces, may suspend, or even destroy, the activity of the adult mosquito. Excessively high temperature always retards mosquito activity. A warm temperature, 80° F., is extremely favorable."

"Atmospheric moisture has a powerful effect upon the adult. High percentages are favorable and low percentage deadly. Rain itself is decidedly injurious and prevents adult mosquito activity. Wind of low velocity, high temperature (about 80° F.) and high humidity appear to be the ones that favor long flights." These conclusions are drawn chiefly from field observations made by men engaged in practical mosquito control.

Chapman (1) in his study on the life history of *Taphrocercus gracilis* (Say) publishes observations made on the adult beetles which were greatly influenced by high temperature and strong light, but with low temperature they were inactive, so that they retracted their appendages and dropped from the foliage. Cook (2) considered the effect of temperature and humidity in relation to the number of moths flying at night. He employed

* Paper No. 235 of the Journal series, New Jersey Agricultural Experiment Stations, Department of Entomology.

the method of partial correlation to measure the effects and concludes that temperature has a positive influence on the catch at all times, but the influence is much larger below than above optimum humidity. Humidity was found by far the most important factor studied. Any increase in the 7 P. M. humidity up to about 54 per cent. tends to increase the catch, while beyond this value it decreases the catch in almost the same proportions. Shapley (7) in a study on the thermokinetics of *Liometopum apiculatum* Mayr states that as the temperature rises 30° C. the speed of the ants changes 15 fold, increasing uniformly from 0.44 to 6.60 cm. a second. In a later note (8) the same author states that at a given temperature the speed of one ant is nearly 50 per cent. greater than of another. There are apparently great differences in individual behavior and sufficient numbers of insects should be used to derive a true average. Stumper (10), publishing some results on the thermic coefficient of certain ants, states that activity is found to occur only between certain limits of temperature; these limits are variable according to the species but constant for each species. For instance, *Formica rufa* is active between 46–104° F., *Lasius niger* between 50–82°, and *Myrmica rubra* between 46–82° F. Sviridenko (9), studying the behavior of the maroccona locust under different meteorological conditions, found that larva swarms start their daily march in the morning when the temperature reaches 73–80° F. and stop whenever it drops again to the same level, whether in the evening or during the day, owing to clouds or wind. At a temperature of about 86–92° F. the swarms also cease their movement, obviously from excess of heat. Thus the movement of larvæ of the locust is due to thermotaxis.

The effect of temperature upon the locomotor activity of the boll weevil was tested by Morrill (5) who found that as temperature was gradually raised the activity of the weevils increased up to 105° F. At 95° F. the beetles were very active, at 86° they began to lose activity; and at 37° all movement ceased. Out of doors, weevil activity began and ceased at about 75°; feeding continuing at lower temperatures than oviposition. Those observations show that activity differs for different species of insects, but that within the temperature range the general behavior of the different insects is very similar.

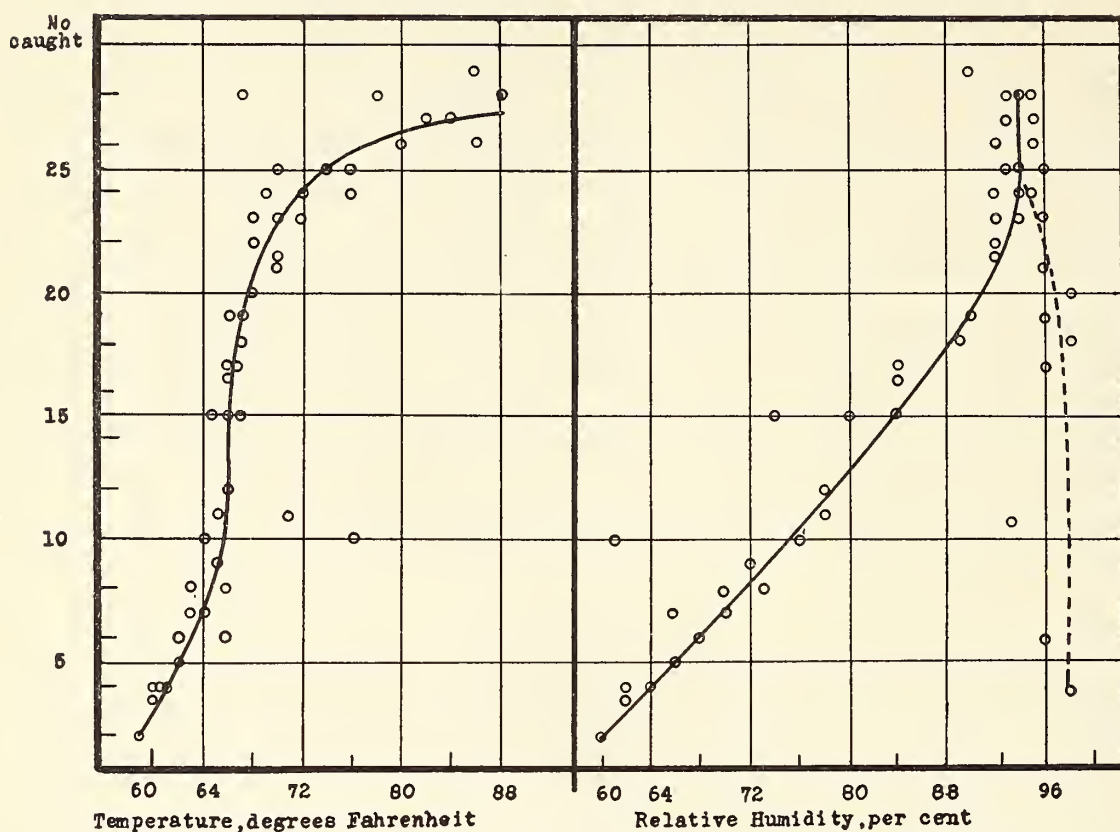
In a former publication an attempt was made by the writer (6) to find possible simple direct relations between atmospheric conditions and the behavior of the salt marsh mosquitoes, *Aedes sollicitans* and *A. cantator*. It was found that temperature at the time of observation is the deciding factor for the activities of these insects. Their activity increases with the increase of temperature unless the temperature becomes too high. A wind velocity of more than eight miles an hour overcomes the influence of temperature. The number of salt marsh mosquitoes alighting increase in almost linear fashion with the increase of relative humidity up to 85 per cent.; from 85 to 95 per cent. relative humidity, the numbers alighting remain nearly constant.

Experimental

A somewhat similar study was made during 1924 in regard to *Culex pipiens*. Mosquitoes were collected for 15 minute periods near a sewage-charged brook in Highland Park, N. J. The mosquitoes were captured alive to be used in other experiments, and the actual numbers which could have been caught by killing were consequently greater than the numbers caught alive. With increasing activity of the insects it became increasingly difficult to capture them alive, but it was observed that when a certain temperature "limit" (70°-75° F.) was reached the stimulating effect of temperature was such that much less attention was paid by the insects to the movements of the observer and it became easier to place the bottles over them without being distracted from their feeding. Nevertheless it is possible that some error obscures the actual facts around the temperature "limit."

Results

The results obtained are shown graphically in figure 1. In the first part of this figure the catches are plotted together with the temperature at the time, irrespective of other influences such as relative humidity, wind and light intensity. In the second part of the figure the numbers caught are compared with the per cent. relative humidity existing at the beginning of each collecting period. No attention is here paid to temperature. A perusal



RELATION BETWEEN TEMPERATURE, HUMIDITY AND MOSQUITOES CAUGHT IN 15-MINUTE PERIODS

of the first part of the figure seems to show that a definite relation exists between temperature and the numbers of mosquitoes alighting and caught. From all my studies alighting seems to be due mainly to an increase in activity, although an increase in attractiveness of the host under higher temperatures might play a role. It can be seen from the curve that up to about 70° F. the temperature accelerates the activity of the insects greatly, but temperatures above 70° F. do not seem to increase the activities of these mosquitoes at the same rate. In this respect it is of interest to record the behavior of freshly caught *C. pipiens* females which were confined in closed glass containers submerged in water which was slowly heated to different temperatures. A condensed summary of the observations is given in Table 1.

From these notes it can be seen that below 70° F. the activity of the insects is slight (compare Chapman, Shapley and Morrill) but at temperatures between 70° and 80° F. activity increases rapidly, while at temperatures between 80° and 90° F. greater

activity was exhibited. At higher temperatures their activity becomes much less (see Sivoridenko) until at 112°–113° the insects were killed.

TABLE 1.—REACTION OF CONFINED MOSQUITOES TO TEMPERATURE

Temperature °F.	Behavior of Mosquitoes.
55	Inactive, resting.
60	Inactive, legs are moved at intervals.
65	Crawl for short distances at intervals.
70	Crawl intermittently.
74	Crawl and fly occasionally.
77	Activity increased.
80	Active crawling and flying.
82	Flying mostly.
85	Very active, nearly continuous flying.
90	Very active, flying, sing.
95	Fly with short rest periods in which trying to puncture glass (becoming uncomfortable?).
100	Extremely active, sing in very high tone.
102	Much less active.
104	Fly only occasionally.
106	Quiescence.
108	Stunned, fall on backs, move legs, recuperate when taken out.
110	All activity ceased, but revive after some time when placed in the open.
112–113	Killed.

Keeping in mind that these experiments were carried out with confined insects so that there was no chance to escape, the reactions of the mosquitoes seem fairly well to correspond with those outdoors at different temperatures.

Attention is called to the interesting shape of the curve which resembles closely the well known growth curve. The resemblance might be accidental.

If Figure 1 and the brief discussion of the temperature curve is compared with the general statements made by Headlee, it can be seen that the detailed observations are in close accord with the general observations made by field workers in the course of several years mosquito control work.

A glance at the right hand part of the figure showing the relations between relative humidity values and numbers of mosquitoes caught indicates that there also exists a direct relation between relative humidity and activity of the house mosquitoes. The relation is positive up to 90 per cent. relative humidity; from then on activity seems to be accelerated to about 94–95 per cent. humidity, followed by a sharp drop when the saturation point is approaching. The acceleration seems to be the reverse from what was found for temperature. It should be noted also that activities were apparently much less stimulated by humidity than by temperature. It is possible that humidity is of greater importance (see Cook) than these graphs show. In this respect it is extremely interesting to compare data published by Headlee (4) showing the effect of proportion of atmospheric moisture on the development of the bean weevil. A curve representing the period from egg laying to the formation of pupa gives according to this investigator "a pretty accurate idea of the effects of the different percentages of atmospheric humidity (experimented with) on the rate of development of this insect." His curve has very much the same shape as the one given in this paper for the activity of adult mosquitoes. This striking resemblance might not be so extraordinary if the activity of mosquitoes is considered from the standpoint of metabolism. An increase in metabolism is the result of an increase in the speed of chemical reactions, due to changes in temperature and moisture. Increased activity results from an increase in the speed of these chemical reactions and consequently the activity of insects might directly be compared with the development of an insect.

Summary

The 15-minute catches of house mosquitoes are compared with the temperature and per cent. relative humidity existing at the time of collecting.

The graphically shown results indicate that a close relation exists between numbers of mosquitoes caught, which is supposed to indicate activity of the insects, and temperature and also between numbers caught and relative humidity.

Summarized experiments on the behavior of confined mosquitoes at different temperatures seem in accordance with the field observations.

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ENTOMOLOGY IN ZOOLOGICA

The recent report on the Coleoptera from the Williams Galapagos Expedition by Andrew J. Mutchler in volume V, number 20, of Zoologica recalls the various other entomological papers which have appeared in this journal of the New York Zoological Society and with which entomologists should be familiar. Volume III, for instance, contains papers by Wheeler, Schwarz, Barber, Boving, Felt, Brues, Osborn and Mann, and in volume V various specialists have reported in detail upon the insects collected on the Galapagos Islands by the Harrison Williams Expedition.—ED. .

NEW ERIGONINAE FROM TENNESSEE

BY ALEXANDER PETRUNKEVITCH

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The species described in this paper were collected by Mr. S. E. Crumb in Clarksville, Tennessee, in 1921. They form part of the collection made on 50 plats of one square yard each and sent to me for identification by Dr. L. O. Howard, of the Bureau of Entomology. By agreement with Dr. Howard the complete list of arachnids of this collection and the report of their distribution according to plats has been placed in his hands, and there is no further need to give the list here. Since six of the species, all belonging to the sub-family Erigoninae, proved to be new, I thought it advisable to give careful descriptions which would not only permit identification, but help in the understanding of the classification of this group.

The classification of the Erigoninae is still in an unsatisfactory state. Species are often easier identified than genera, especially in the case of males, when accompanied by good drawings. No comprehensive work on the group exists and the opinion of arachnologists as to the value of different characters is still divided. Simon was the first to give detailed descriptions of French Erigoninae in his excellent work, "*Les Arachnides de France*." He made use chiefly of characters derived from the structure of the sternum, the fangs, the eye group and the spines on legs. Later in his great "*Histoire Naturelle des Araignées*" he reclassified the Erigoninae, making use of a number of characters, but still basing his classification on structures mentioned. Dahl was the first to pay special attention to the distribution of auditory hairs or trichobothria, a character the value of which was later recognized by Chyzer and Kulezynski. Nevertheless the use of this character has not found general recognition, partly perhaps because Simon did not consider it of great value and thought that trichobothria are easily overlooked and as easily broken off and lost. The latter statement does not seem to find

support in fact, for it is easy to show that trichobothria are much less subject to injury and loss than are spines and bristles. Moreover, they can be detected without any difficulty under a binocular with sufficient power and with good artificial illumination. On the whole they seem to me to be not only quite reliable characters, but in many ways more reliable than the composition of the eyegroup which, as is well known, is greatly affected by the eyetubercle in some males, so that males do not quite agree with females of the same species in this respect. I have lately examined a number of genera with the result that I cannot recommend too strongly the use of trichobothria as distinctive characters.

Diplocephalus crumbi new species. Male.

Total length 1.58 mm., Carapace 0.75 mm. long, 0.65 mm. wide. Thoracic groove wanting. Clypeus about as high as the quadrangle. Head elevated in the shape of a cube carrying the posterior middle eyes. Foveæ wanting. Margins of carapace smooth, plain. First row of eyes strongly recurved, second row slightly recurved. Viewed from in front first row straight, second row curved downward. Side eyes contiguous, ALE slightly larger than PLE. Eyes of first row equidistant, separated by less than the diameter of the AME. Posterior middle eyes closer together than AME, slightly larger than PLE and only very slightly smaller than AME. Quadrangle wider in front than behind, as long as wide behind. Chelicerae long and powerful, lower margin with three equidistant teeth, upper margin with three teeth of which the distal one is near the base of the fang and separated from the median tooth by double the space between the latter and the proximal tooth. Anterior surface of chelicerae with a tooth situated a little in advance of the median tooth of the upper margin. Fangs normal. Sternum triangular, broadly truncated in front, rounded behind between the hind coxae which are separated from each other by more than their width, slightly wider than long in the ratio of 12/11. Lip occupies middle third of the anterior truncature of the sternum, strongly rebordered, its anterior portion triangular, extending beyond middle of maxillae which are long, with subparallel sides, converging. Legs slender, without spines. Anterior tarsi slightly longer than half of metatarsi (13/22), metatarsi slightly shorter than tibiae (22/27). Posterior tarsi 9/16ths of metatarsi, posterior metatarsi 16/19ths of tibiae. Upper claws of first leg with several strong teeth, those of fourth leg smooth. Third claw smooth. Trichobothria on first leg: 1 on femur near proximal end, 2-2-1 on tibia (first pair close to proximal end, the single one a little before middle), 1 on metatarsus 1/3 from proximal end. A "drum" in middle of tarsus. (The drum is a sense-organ of unknown function.) Trichobothria on fourth leg: 1-2-2-1 on tibia, the last one in middle, none on metatarsus or any of the other joints.

Palpus as figured (Figures 1 and 2). Tibial apophysis long, thin and slightly curved outward, with rounded end. Bulb very large, almost globular. Embolus in the shape of a question mark. Dorsal median line of patella of palp twice as long as the greatest width, strongly convex. Ventral median line slightly longer than greatest width, straight. Cymbium of a very peculiar shape. Its basal half bearing the hæmatodocha is ovoid, then follows a narrow stem which ends in a curved, spoon-shaped dilation. Few short hairs on patella, several long, curved hairs on tibia.

Abdomen eggshaped, overlapping carapace, slightly coriaceous. Color in alcohol: Carapace rufous, median eyes surrounded by black rings. Legs yellowish brown, without markings, darker than abdomen. Chelicerae, lip, maxillae and sternum of the same color as carapace, sternum with darker margins. Bulb of palpi darker than legs, grayish-brown. Abdomen yellow above, with 4 pairs of transverse narrow white lines in posterior third, below grayish-yellow. Spinnerets with smoky tips. Hair on sternum long, on abdomen short and sparse, dark in color. Three males.

***Erigone clarksvillense* new species. Female.**

Total length 2.7 mm. Carapace strongly emarginate behind. Measured in median line only 1.080 mm. long, but fully 1.224 mm. long when measured to greatest extension of posterior edge. Width between 2d and 3d pair of legs 0.936 mm. Width in front 0.396 mm. Abdomen 1.944 mm. long, soft, considerably overhanging carapace, reaching quite to the cephalic portion, sparsely covered with hair. Edge of carapace normal, neither rebordered, nor toothed. Head low. First row of eyes recurved. AME smaller than ALE, separated from each other by their radius, more than by their radius from ALE (by the radius of the latter). Second row viewed from above straight, slightly longer than anterior row. Posterior eyes equidistant, separated from each other by almost their diameter. Lateral eyes contiguous. Quadrangle narrower in front than behind, as long as wide behind. Viewed from in front first row straight, by lower edges, second row strongly curved downward. Clypeus $\frac{4}{6}$ ths the length of the quadrangle, plane, vertical. Sternum triangular, as wide as long, very slightly narrowed in front, with straight anterior margin. Posterior end of sternum extending into a widened portion which is continuous with the carapace, so that the exact length and shape of the sternum cannot be ascertained. Viewed in a certain position, however, when the posterior extension referred to is invisible, the sternum appears truncated straight between the hind coxae. Lip strongly rebordered, narrower at base, occupying middle third of anterior truncature of sternum. Maxillae large, longer than wide, slightly converging. Chelicerae powerful, their outer outline parallel, margins strongly oblique. On front surface near outer edge a row of five very small granules with a tiny spine on each, absent in one of the specimens. Similar granules near upper margin and a small bristle near middle of inner edge. Upper margin with 5 strong teeth, lower margin with 4 smaller

teeth. Thoracic groove longitudinal. On head in front of groove three median hairs, equidistant, curved forward. Hind coxæ separated by slightly less than their width. A median dorsal spine at end of each patella and on all tibiæ $1/3$ d from base. A ventral spine near end of femur. Legs strong. Tarsi of first leg $15/24$ ths of metatarsi, tarsi of fourth leg $13/24$ ths of metatarsi. Metatarsi only by $1/24$ th shorter than tibiæ. Upper claws on all legs with a row of small teeth increasing in length distally. Third claw with a single strong tooth. Palpus without claw. Trichobothria on first leg: 1-1-1-1 on tibia and same on fourth leg, but there is also a small "drum" in middle of fourth tarsus.

Color in alcohol: Carapace yellow-brown with indistinct black marginal line. Legs of the same color as carapace. Chelicerae slightly darker. Sternum much darker, greyish-brown. Abdomen grey with a darker median line and four darker indistinct transverse lines in posterior half. Sides of abdomen with numerous indistinct yellowish spots. Epigynum dark, prominent. (Figures 3 and 4.) Three females.

Tennesseellum new genus.

Abdomen soft. Tracheal spiracle large and placed considerably in advance of the spinnerets. Carapace flat. Anterior row of eyes recurved, posterior row slightly procurved. Quadrangle as long as wide. Clypeus narrow, inclined. Sternum convex, broadly truncated between hind coxæ, slightly longer than wide, reticulated. Upper margin of chelicerae with 1 tooth, lower margin with two teeth. Legs short and slender. Tarsi longer than half of metatarsus, the latter almost as long as tibia. First metatarsus with a trichobothrium $1/3$ from base, fourth metatarsus without trichobothria. Typus *T. minutum*.

Tennesseellum minutum new species. Female.

Total length 2.232 mm. Carapace 0.756 mm. long, 0.540 mm. wide, rounded in front, 0.252 mm. between outside edges of ALE which occupy the entire width. Longitudinal groove well marked. Carapace flat, head not elevated, with a row of 3 median bristles, first immediately in front of longitudinal groove, third near the eyes. Abdomen soft, 1.440 mm. long, barely overlapping carapace, so that in certain positions the entire petiolus is visible. The tracheal spiracle appears as a distinct transverse line considerably in advance of the spinnerets, the distance between the genital groove and the spiracle being double that between the spiracle and the anterior spinnerets. Anterior row of eyes recurved. AME slightly smaller than ALE. Posterior row slightly procurved. Eyes equidistant, separated by less than their diameter. Quadrangle very slightly wider behind than in front, as long as wide behind. AME overhanging the clypeus which is slightly inclined forward and only $1/2$ the length of the quadrangle. Viewed from in front anterior row is very slightly curved downward. AME separated from each other by their radius, slightly more than by their radius from the ALE which are a

little larger. Lateral eyes contiguous. Chelicerae weak, margins but slightly oblique, upper margin with a single tooth, lower margin with two teeth. On outer surface of chelicerae a well developed stridulating ridge. Lip wider than long, strongly rebordered. Maxillae short, stout. Sternum convex, broadly truncated between hind coxae, reticulated, slightly longer than wide (in the proportion of 13/11). Legs short and slender. Tarsi of first leg 50/73 ds of metatarsi, and these 73/75 ths of tibiae. Tarsi of fourth leg 46/80 ths of metatarsi and these 80/87 ths of tibiae. A slender spine below near distal end of each femur, and above on first tibia. A still weaker spine above near base of first tibia, while on other legs it is not different from other hairs. Upper claws on all legs with a few very small teeth, third claw with a single small tooth. Palpus without claw. Trichobothria on first leg: 1-1 on tibia and 1 on metatarsus 1/3 d from base. On fourth leg only 1-1-1 trichobothria on tibia, none on metatarsus. No "drum" on tarsi. Color in alcohol: Carapace, sternum and legs dark yellow, but first three pairs of femora and the distal end of the palpi are dark brown. Abdomen dark grey with indistinct transverse striation on sides. A single female. Figure 5.

Oedothorax howardi new species. Female.

Total length 2.448. Carapace 1.044 mm. long, 0.792 mm. wide between 2d and 3d pair of legs, 0.360 mm. wide in front, rounded behind with median semicircular emargination. Longitudinal groove barely discernible. Surface of carapace evenly reticulated. Lateral eyes on a tubercle. Clypeus vertical, plane, reticulated, not quite as high as quadrangle. First row of eyes straight by anterior edges, second row strongly procurved. Both rows equally long (Figure 9). Lateral eyes contiguous. ALE much the largest, AME the smallest. Posterior eyes equal in size, equidistant, separated from each other by almost their diameter. AME separated from each other by $1\frac{1}{2}$ (one and a half) their radius, and by almost their diameter from ALE which are almost twice as large. Chelicerae strong, short, with oblique margins. Lower margin with five equidistant small teeth, upper margin with five strong teeth of which the second proximal tooth is the longest. Fang with distinctly serrated outer edge (Stridulating organ?). Lip wider than long, occupies middle third of anterior margin of sternum. Maxillae widened in front. Sternum roughly reticulated, slightly convex, triangular, almost as wide in front as between 2d and 3d coxae. Anterior margin of sternum slightly procurved. Posterior end procurved between hind coxae, rounded. Hind coxae separated by their width. Legs short, stout. All tarsi only slightly shorter than metatarsi. A median dorsal spine at end of patella and a little before middle of tibia on all legs. One ventral spine near distal end of anterior femora. Upper claws on all legs with a few fine teeth, third claw with 2 very fine teeth. Palpus without claw. Trichobothria on first leg (Figure 7): on tibia 1-1-1-1, none on other segments. Trichobothria of fourth leg (Figure 8): on tibia 1-1-1-1, on metatarsus 1, very long, in middle. No "drum" on tarsi. No hairs on carapace. Abdomen soft, ovoid,

overlapping carapace, sparsely covered with minute hairs. Color in alcohol. Carapace, sternum, lip and maxillæ dark brown, legs yellow, almost orange. Abdomen dark grey-brown. Epigynum as figured (Figure 6). Three females.

Caseola howardi new species. Female.

Total length 1.872 mm. Carapace 0.756 mm. long, 0.576 mm wide, little narrowed in front, so that the front is much wider than the eyegroup. Two small median bristles on head, first just at the posterior limit of the head, second slightly in front of first. Carapace smooth, without hair. First row of eyes straight, second strongly procurved, slightly longer. Lateral eyes contiguous. Viewed from in front first row is distinctly bent downwards, AME much smaller than ALE, separated by their diameter both from each other and from the laterals. Posterior eyes equal in size to ALE and equidistant. Quadrangle narrower in front than behind, as long as wide behind. Clypeus as high as quadrangle, simple, slightly oblique, with anterior eyes overhanging it. Lip much wider than long, rebordered. Maxillæ inclined over lip, curved, inner angle almost 90 degrees. Chelicerae parallel by outer edges. Margins oblique. Upper margin with 5 strong teeth, lower margin with 5 weaker teeth. Sternum triangular, produced between hind coxæ where it is squarely truncated, convex, punctate, as wide as long, not narrowed in front. Legs short, first pair considerably shorter than fourth. A dorsal spine at end of all patellæ, and a ventral bristle near end of all femora, assuming the appearance of a slender spine only on femora of fourth pair. No spines elsewhere. Metatarsi much shorter than tibiæ. First tarsus 42/50 ths of metatarsus, fourth tarsus 40/51 sts of metatarsus. Upper claws on all legs with a series of strong teeth, third claw with one minute tooth. Palpus without claw. Trichobothria of first leg: on tibia 1-1, on metatarsus 1 in middle. Trichobothria of fourth leg: on tibia 1-1-2-1-1, none elsewhere. No "drum" on tarsi. Abdomen soft, 1.189 mm. long, slightly overhanging carapace. Color in alcohol. Carapace, legs, palpi and maxillæ yellow. Sternum yellow with smoky edge, minutely mottled with black. Abdomen uniformly greyish above and below. Epigynum as figured (Figure 10), almost colorless, except for chitinized median lines. One female.

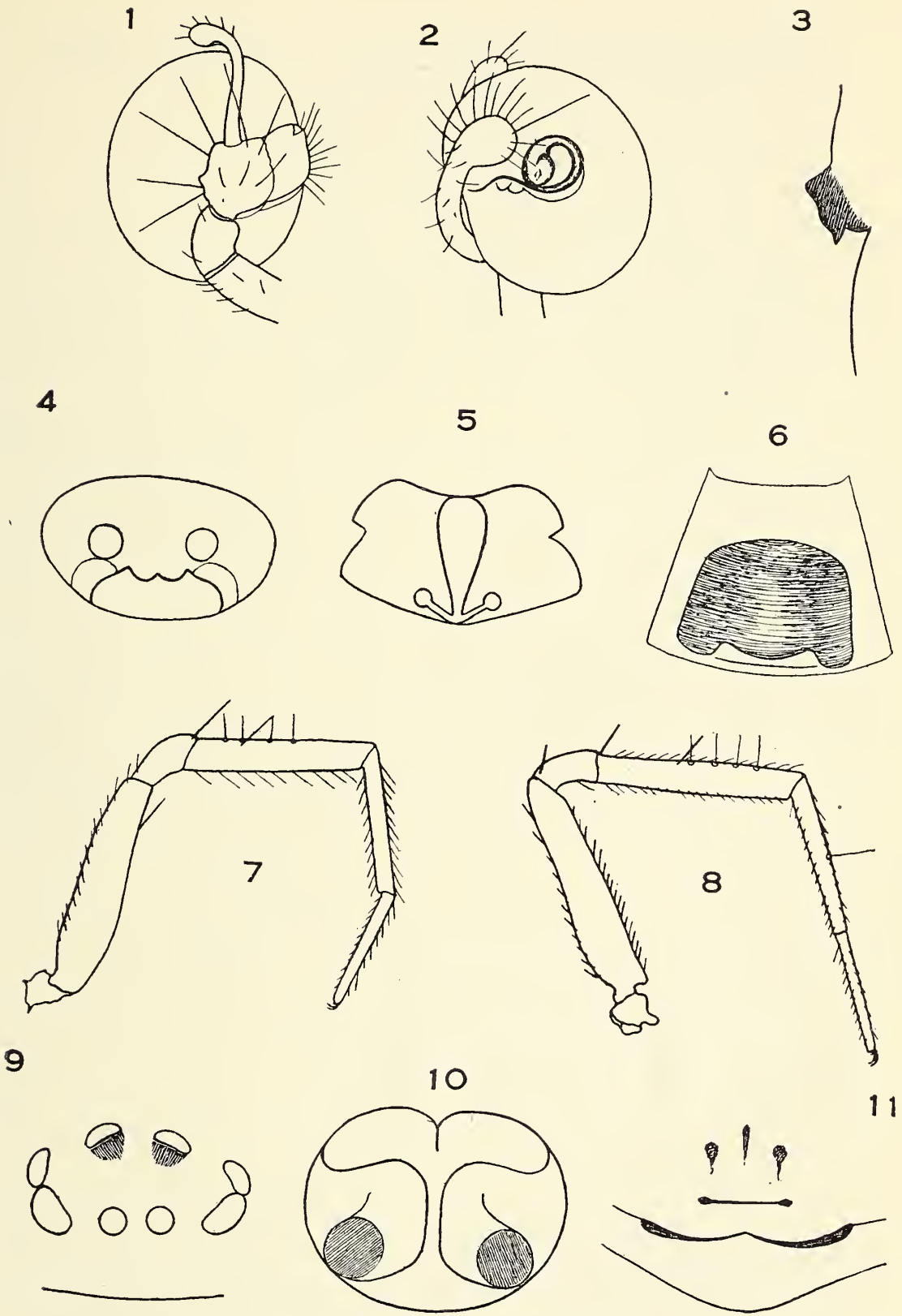
Gongylidiellum tennesseense new species. Female.

Total length 1.584 mm. Carapace 0.648 mm. long, 0.504 mm. wide, little narrowed in front which is wider than eye area. Longitudinal groove barely noticeable. Head not elevated. Clypeus $\frac{3}{4}$ as high as quadrangle. First row of eyes slightly recurved, second row slightly procurved. Laterals contiguous. AME smallest, ALE slightly larger than PLE. AME in a transversely oval black spot, sub-contiguous, slightly but distinctly separated from ALE. PME separated by their diameter from each other and by less than diameter from PLE. Quadrangle narrower in front than behind, as long as wide behind. Chelicerae weak. Upper margin with 5 teeth, lower

with 4 small teeth. Sternum flat, triangular, longer than wide, squarely truncated between hind coxæ. Legs slender, fourth leg the longest. First tarsus 41/52 ds of metatarsus, first metatarsus 52/62 ds of tibia. Fourth tarsus 37/54 ts of metatarsus, fourth metatarsus 54/68 ths of tibia. Spines very slender. One spine below, near distal end of all femora, while elsewhere legs are covered only with hair. Upper claws on all legs with a few small teeth, third claw with a single small tooth. Palpus without claw. Trichobothria of first leg: on tibia 1-1-1, none elsewhere. Trichobothria of fourth leg: on tibia 1-1-1, none elsewhere. No "drum" on tarsi. Abdomen soft, ovoid, 0.972 mm. long, overhanging carapace a little. Color in alcohol. Carapace, chelicerae, maxillae and legs yellow. Sternum much darker, mottled with black. Abdomen greyish yellow. Epigynum as figured (Figure 11). One female.

EXPLANATION OF PLATE VIII

- Fig. 1. *Diplocephalus crumbi* n. sp. Left palpal bulb from above, showing the tibia with long bristles and the long, curved tibial apophysis.
- Fig. 2. Same palpal bulb from below, showing curved embolus, cymbium widened at the end, and the tip of the tibial apophysis behind the hæmatodocha, which is of an unusually large size and almost spherical in shape.
- Fig. 3. *Erigone clarksvillense* n. sp. Epigynum in profile.
- Fig. 4. Same epigynum in surface view.
- Fig. 5. *Tennesseeillum minutum* n. g., n. sp. Epigynum.
- Fig. 6. *Oedothorax howardi* n. sp. Epigynum with the trapeze-shaped grey area surrounding it.
- Fig. 7. *Oedothorax howardi*. First leg, showing the proportions of the segments, spines and trichobothria.
- Fig. 8. *Oedothorax howardi*. Fourth leg, showing same structures and the trichobothrium of the metatarsus.
- Fig. 9. *Oedothorax howardi*. Eyegroup and clypeus. In the position shown only anterior middle eyes appear as circles, although all eyes are perfectly round when viewed in the proper direction.
- Fig. 10. *Caseola howardi* n. sp. Epigynum.
- Fig. 11. *Gongylidiellum tennesseense* n. sp. Epigynum and genital groove.



ERIGONINAE

NEW SPECIES OF HELMIS (COLEOPTERA)

BY H. C. FALL

TYNGSBORO, MASS.

In the course of a recent rearrangement of my material in this genus, the following undescribed species were discovered. The detection of the identity of a species formerly described by the writer with an older species of LeConte's is also noted.

Helmis brunnescens new species.

Elongate, subparallel, brownish piceous, in part with feebly aeneous lustre in certain lights, humeral umbone and extreme apex of elytra nubilously paler; antennae, tarsi and often the protibiae testaceous. Upper surface sparsely finely pubescent. Antennae not quite attaining the hind angles of the thorax. Head rather finely but strongly punctate, front scarcely twice as wide as the longest diameter of the eye. Prothorax about $1/7$ wider than long, sides feebly diverging to basal third, thence subparallel and slightly sinuate to the sharply defined and slightly prominent base angles; surface strongly punctate, sparsely on the disk, more coarsely and closely toward the front angles. Elytra parallel in basal two thirds, apex sharply rounded, rows of serial punctures scarcely impressed, interspaces with a regular series of fine punctures. Prosternum coarsely closely punctate; ventral segments more sparsely so. Length, 2.25 to 2.35 mm.; width about .75 mm.

Described from four specimens taken in Lake Co., California, V-1895, by Dr. E. C. Van Dyke, from whom I received them.

This species is similar in form and structure to *vittatus*, *bivattatus* and *4-notatus*, differing from all of them in the absence of elytral vittae and its somewhat coarser elytral punctures, both of the striae and interspaces.

Helmis castanipennis, new species.

Of the same size but of broader form than the preceding species, the length being rather less than $2\frac{1}{2}$ times the width. Head and thorax black, elytra and body beneath brown, the elytra with or without a faint nebulous clouding medio-laterally and narrowly along the suture; upper surface thinly pubescent and moderately shining. Head sparsely very finely punctate; antennae short, not attaining the bend in the sides of the thorax.

Thorax about $1/6$ wider than long, sides diverging from the acute front angles to the basal third, thence parallel and feebly sinuate to the base angles, which are just less than right; disk with a strong longitudinal plica each side in about the basal two-fifths; sides exterior to the plica subrugosely punctate, the intermediate surface polished and sparsely punctate, a small punctiform impression each side of a feeble scutellar emargination. Elytra slightly widening to apical third, with feebly to scarcely impressed strongly punctured striae, the interspaces finely uniseriately punctate. Body beneath finely and remotely punctulate, the prosternum as usual more coarsely sculptured. Length, 2.35 mm.; width 1.1 mm.

The type is one of two examples from Wyoming, exact locality unknown. A third specimen from "W. T." appears to be identical.

This species is represented in the LeConte Collection by five examples (4 from Wyo., 1 from B. C.) placed with *divergens*, which species it agrees with nearly in size and form, but differs notably in color and in its much sparser punctuation.

***Helmis immunis*, new species.**

Rather broadly subovate, somewhat inflated posteriorly, the elytra being widest at about their middle; piceous, feebly bronzed, elytra without trace of spots or vittae. Antennae short, attaining the middle of the sides of the prothorax, rufotestaceous, the three outer joints sometimes infusate. Prothorax about one third wider than long, sides nearly straight and subparallel or feebly convergent anteriorly for a short distance at base, thence more strongly convergent to the acute apical angles, surface shining, moderately closely rather finely punctate; basal striae strong, about one third the length of the thorax; base slightly emarginate before the scutellum, the punctiform foveae not very distinct. Elytra one third longer than wide, rather strongly striate, striae coarsely punctate, intervals, minutely punctulate. Body beneath brownish, sparsely punctate; femora piceous, tibiae and tarsi rufous. Length, (type) 2.25 mm.; width, 1.2 mm.

The type is from Stratford, Conn., collected by M. P. Lappe, Aug. 29, 1919. With the type I place four examples from Clementon, New Jersey, that are unquestionably identical, though for the most part so completely incrusted as to make a study of the details of sculpture impossible.

This species belongs near *ovalis* and allies, but is at once recognizable by its more ovate form and immaculate elytra.

✓ **Helmis tardellus**, new species.

Moderately elongate obovate, piceous with more or less distinct aeneous or violaceo-aeneous lustre; elytra each with two rufotestaceous spots, one at the humerus, obliquely suboval in form, extending from the base to the basal fourth, and inwardly to the third stria; the other more elongate, extending from the middle to about the apical sixth, and attaining neither margin nor suture. Upper surface distinctly fulvo-pubescent, body beneath brownish, clothed somewhat densely with short appressed yellow hair, femora except the knees similarly densely pubescent. Antennæ short, barely reaching the middle of the side margins of the prothorax, rufotestaceous basally, outer three or four joints piceous. Head and thorax alutaceous and rather finely punctured, the punctures separated on the disk by from one to two times their own diameters, the sides of the thorax exterior to the short basal plicae becoming more densely subrugosely sculptured; base with a small punctiform fovea on either side of the ante-scutellar emargination. The thorax is a little wider than long, sides divergent from apex to base, a little excurved medially. Elytra two thirds longer than wide, sides feebly arcuate and diverging in basal half, striae feebly impressed, rather coarsely punctured, interspaces with a nearly regular series of very fine punctures. Body beneath sparsely punctate laterally and posteriorly, prosternum more closely and coarsely sculptured. Length, (type) 2 mm.; width .9 mm.

Described from three examples of uniform size taken at Tyngsboro, Mass., the type and one paratype bearing date 8-31-'00, the third example without date.

This species bears a general resemblance to *elegans*, but is of broader form and more dilated posteriorly, with coarser striae punctures and smaller elytral spots. In *elegans* the humeral spot is produced inward nearly to the suture and attains the middle of the length, and the posterior spot is vittiform and much longer than in the present species.

Helmis ampliatus, new species.

Form unusually broad, oval, not inflated posteriorly, piceous bronzed, fulvo-pubescent, elytra with a reddish yellow vitta from humerus to apex, often becoming faint at basal third. Antennæ short, rufotestaceous, as long as the width of the head across the eyes. Prothorax strongly transverse, sides much rounded, subparallel in basal two-fifths, surface rather coarsely and densely punctate, the punctures separated as a rule by rather less than their own diameters; longitudinal impressed lines deep, and two-fifths as long as the thorax; base emarginate in front of the scutellum but without the punctiform foveae. Elytra one third longer than wide, sides

broadly arcuate and subparallel in basal two thirds, striae rather strongly impressed, especially laterally, and coarsely punctate throughout. Body beneath brownish, more strongly sculptured than usual. Legs piceous, the tarsi rufous. Length, (type) 2.35 mm.; width 1.25 mm., the five examples before me varying very little in size.

The type is one of three examples from Lowell, Mass., and bears date 7-23-'93. Single specimens from Stratford, Conn. (K. F. Chamberlain), and "Va." are at hand. The last named bears my label "*ovalis* in Horn Collection."

The present species is allied to, and undoubtedly goes as *ovalis* in many collections. It is, however, quite distinct from the LeConte type, being of much broader form, with more densely coarsely punctured thorax, the basal impressed lines being twice as long and very much deeper and coarser. In three measured specimens of *ovalis* the lengths of the elytra were respectively 1.57 (type), 1.54 and 1.49 times the width; while in four specimens of *ampliatius* the ratios were 1.35 (type), 1.30, 1.27 and 1.36. In *ovalis* the sides of the thorax are less rounded, and continuously divergent throughout their length, though less strongly so basally.

***Helmis dispar*, new species.**

Male. Form stout, elytra very convex, moderately shining, very sparsely, finely and inconspicuously pubescent. Above black, the elytra red in about the basal third and apical fourth; beneath and legs brown. Antennae reddish brown, terminal joint slightly dusky, fully as long as the thorax, the outer three joints not forming a club, the eighth joint being similar to the ninth and scarcely smaller. Head opaque, obscurely punctate. Prothorax a little wider than long, sides only slightly curved and continuously divergent from the apex, briefly flaring at the basal angles; disk each side with a deep oblique subbasal impression, exterior to which is an ill defined longitudinal ridge which is continued as a fine carina to the apex; surface between the lateral carinae sparsely barely perceptibly punctate, exterior to the carinae rugosely sculptured, and in the anterior half deeply impressed along the margin. Elytra short, ovate, one half wider than the thorax, widest near the middle, one fourth longer than wide; striae fine and finely punctate, intervals flat or nearly so, scarcely perceptibly punctate. Body beneath and legs dark brownish red. Length, 2.1 mm.; width, 1.2 mm.

Female. Similar to the male in all essentials, but of less chunky form, twice as long as wide, basal red area of the elytra shorter and interrupted

at middle, leaving a squarish humeral spot, the apical pale area reduced to a small elongate discal spot on each at the apical fourth. Length, 2.5 mm.; width, 1.25 mm.

Described from a single pair sent by Dr. F. E. Blaisdell who collected them at Shasta Retreat, Siskiyou Co., California.

If the two specimens associated are the sexes of the same species as seems almost certain, the difference in form between the sexes is quite unique among our known species. In the female the base of the thorax is feebly emarginate before the scutellum, and the basal foveae are quite distinct; in the male both these features are obsolete.

Helmis antennatus Fall = *corpulentus* Lec.

This species at the time of its description was based largely on a previously unmentioned and supposedly unique character, *viz.*, the 10-jointed antennæ. A recent examination of the type of *corpulentus* Lec. shows that it possesses this character and careful comparison convinces me that the two species are identical. The LeConte collection contains four examples of *corpulentus*, three from British Columbia and one from Veta Pass, Colorado.

Acronycta lanceolaria Grt.

The first *Acronycta lanceolaria* Grt. for New Jersey was recorded by Mr. Otto Buchholz. Several years later, when we were strolling in the woods at Lakehurst (May 28th) I found one female sitting, half hidden, on a pine trunk. Later (in 1922) I saw another *Acronycta* high up on a pine in the same vicinity and was delighted to have a second specimen of that species. I did not mind the trouble of getting it down, but was very much disappointed when it proved to be an *oblinita*, which it resembles quite a little.

On the evening of May 5, 1924, I saw what I thought to be an *Estigmene congrua* Wlk. sitting on a light pole and did not care to take it, but changed my mind and after manœuvring to get it with a long wire I was delighted to have a female *lanceolaria*. It pays to go to a little trouble if you get a rare specimen once in a while.—FREDERICK LEMMER.

SOME LITTLE KNOWN NOCTUID LARVAE OF THE
GENERA CHABUATA, GORTYNA AND
ARCHANARA (LEPIDOPTERA)

BY HENRY BIRD

RYE, N. Y.

Chabuata (Tricholita) signata Walk.

Although the larva of this species hibernates in the second or third instar, there is but one brood per season, whereas most of the agrotid noctuids with which the writer is familiar that hibernate as larvæ, have two appearances of adults each season. Hibernation seems to have more hazards to a species when it occurs in the larval form, as against egg, pupa and perhaps we may say adult, though there is all too little data on any of these features. *Signata* larvæ seem to choose their winter quarters with unusual care. They are partial to the dry, hollow plant stems of the succeeding summer, and may at times be found wintering in the stem galls of *Papaipema nebris* Gn., when the latter has been boring *Ambrosia trifida*.

In the warm days of mid-April they sally forth—at night probably—and seem to be general feeders on plantain, dandelion and such early starting plants. Strangely, they yet cling to these galls for a while at any rate, the fresh green frass beside them in the galls proving they have recently fed, although it is in no way likely they get back to the same gall on every occasion. As this *Ambrosia* is apt to grow in thick stands and most of the stems to have been inhabited by *nebris*, when the latter occur at all, this action of *signata* is comparatively simple.

Occasionally a curious thing happens. In certain recurring years a large percentage of *nebris* larvæ fall to the vipionid parasite, *Microplitis gortynæ* Riley. Shortly before maturity, about August first, the host succumbs in its gall and thirty or more *gortynæ* larvæ emerge and spin up in an encircling band of ribbed cocoons around the dying host which has fallen to the

bottom of the gall, just above the ventilating opening. In time some dipterous scavengers finish the *nebris* pellicle and the more or less complete ring of parasitic cocoons remain clogging the burrow, through the winter and on to the last days of June, when, if all has gone well with *gortynæ*, they emerge. If, however, a *signata* larva has happened on such a situation in seeking a hibernaculum, they find the parasitic cocoons an incumbrance in gaining ingress and make a way for themselves by gnawing off a section thereof, to the destruction of such puparia as fall in the way. This would seem to be a case where a caterpillar gets back at a parasite, does a saving act for others of its kind even though not its own, but there are complications which affect such a concrete result. From their long exposure, August to June, the *gortynæ* cocoons become a ready target for a number of other hymenopterous parasites, which thus perform a secondary role. *Hemiteles tenellus* Say, *Astomaspis fulvipes* Grav., *Eupteromalus viridescens* Walsh, *Gelis microplitidis* Gahan and an undetermined *Ethelurgus* and *Thysiotorus* species (these determinations by Mr. A. B. Gahan) are likely to be inhabiting these cocoons to a considerable degree, so to what extent the *Chabuata* in its onslaught upon the interfering cocoon cluster may be aiding or abetting the *Papaipema* situation may never be known. Finishing the larval career about June first, *signata* enters the ground for pupation and does not emerge as a moth until August.

Mature larva. Typical of the Hadeninæ in that the body widens from the head to the eleventh segment, where the bulk is greatest, with the last two joints bent ventrad and their diameter decreasing. Hence the larva assume a slightly humped condition at the eleventh somite. The color is an even pale brown all over without contrasts; a vague mottling in deeper tone exists, which is more noticeable in the earlier stages.

Head normal, rounded, shining, brown and mottled, setæ about mouth parts most developed, width 2.9 mm. Thoracic legs concolorous, setæ prominent, crotchets of fourth abdominal leg number 28.

The cervical shield bears prominent setæ, is polished, of lighter tone than head and nearly as wide; anal shield concolorous and

less chitinized. Spiracles elliptical, black-ringed, those on joints one and eleven are slightly larger. Of the tubercles, III, IV and V are the best defined on the abdominal segments, equal, IV being relatively close to the spiracle and about one-sixth its size. Larval length 41 mm.

Gortyna stramentosa Gn.

The larval procedure with this species was first encountered at Montreal as the result of a painstaking and long continued effort by Mr. A. F. Winn, who published entertainingly of the discovery at the time, 1915.¹ The moth had been a light capture there for many previous years, and its larva proves to be very abundant when the habit and foodplant, *Scrophularia leporella*, become known. Southward, at the latitude of New York it is an uncommon insect, but two occurrences of the larva have been noted at Rye. It probably follows the Canadian zone westward in considerable abundance, and the larva has been encountered by Mr. G. P. Engelhardt in Colorado, where a closely allied species of *Scrophularia* was attacked. Associated with it as a parasite, even in Colorado, is *Mascicera senilis* Meig., a most important check to such borers. Upon our own observations this Tachinid has positive record of attacking twenty-two allied species, and according to information, it finds the introduced Corn Borer also legitimate plunder.

In habit *stramentosa* is more truly a borer in the root of its foodplant than its ally *immanis*, which works at the crown of Hop. The first stages undoubtedly show a transverse, ringed color effect similar to *micaceæ*, *immanis* and others, the characteristic gortynid ornamentation.

Mature larva. Stout and cylindrical, the final instar not differing from the penultimate except in size. A slightly ringed appearance yet exists. The color is brownish, paler at the interspaces of the somites. Head normal, width 3.3 mm. Cervical shield is a shining plate, irregularly edged anteriorly with blackish. At the tubercles the plates are well evident; specific individuality is shown at III on abdominal joints where the plate

¹ Report of the Entomological Society of Ontario for 1915, p. 43.

is very close to the upper, anterior margin of the spiracle—this to a greater degree than with its near allies; III, IV and V almost equal the spiracle. On joint eleven, I and II much increased, as is also III on joint twelve. Anal plate prominent, covering the last somite. Crotchets number 14. Larval length 42 mm.

Archanara oblonga Grt.

Collectively, the three species of *Archanara* (Nonagria) occurring in the eastern United States can be considered as having larvæ which subsist in semi-aquatic conditions and are pronounced in their choice of respective foodplants. They are miners in stem and rootstock, pupate in their burrows, emerge shortly as adults and are single brooded in the north at any rate. It may be noted the pupæ rest normally upright in the galleries, whereas an allied European species is recorded as reversing this position. Dr. J. B. Smith, 1903,² has detailed the unusual structures of the adult, the remarkable clypeal horn, also the female ovipositor and its appendages wherewith a hibernaculum is made for the overwintering eggs. At that date the life history of *oblonga* only seemed known.

Numerous workers have contributed details here; Claassen, 1921,³ summarizes the life history and larval details and gives the principal bibliography. While *Typha latifolia* is the generally recorded foodplant, the writer has found *T. angustifolia* more frequently tenanted by the species locally. From the very short pupal period, averaging ten to twelve days, it perhaps sets the record for any single brooded noctuid of its zonal fauna in the rapidity of this change.

Archanara laeta Morr.

Larval relationship indicates that this species is very close to the preceding, and that it should follow it in the lists. *Sparganium eurycarpum* is the foodplant with which it has been thus

² Revision of the Boreal-American Species of Nonagria. Proc. Ent. Soc. Washington, Vol. V, No. 4, 1903.

³ Cornell University Agricultural Experiment Station Memoir 47.

far associated, but it may also take up with other species of the burr-reed. Larval procedure is similar to that of *oblonga*, and maturity is reached about the end of July. Pupation is in the larval tunnel, lasts fifteen to eighteen days, with emergence dates Aug. 14–24. The species was rather common about Buffalo, N. Y., at the proper ecological environment in 1916, according to Mr. H. G. Baumann. Though solitary individually, they nevertheless occur in well defined colonies, the progeny of a single parent doubtless.

Mature larva. A general similarity follows through the various instars; at maturity there exists a stout, cylindrical, naked larva of dull, raw, umber brown color, with a dorsal and subdorsal continuous line easily traceable, defined as paler markings. Head normal, rounded, setæ weak or absent, labrum tipped with black, otherwise concolorous yellow brown; width 2.4 mm. Cervical shield is heavily chitinized, as wide as head and similar in color. Anal shield also similar but proportionately reduced. The tubercle plates are the merest black dots, bearing mostly minute black setæ requiring considerable magnification for discernment; III and IV on the abdominal joints are best defined. They are estimated to be one-tenth the size of the spiracle. The latter are flattened-elliptical in form, and black-rimmed. Length of larva 39 mm.

Archanara subflava Grt.

The foodplant is the giant bulrush, *Scirpus occidentalis*, and the larval work is confined to the crown and rootstock in the later stages, though they yet ascend the hollow stems on occasion. Pupation occurred in the root tunnel in breeding boxes, but its duration was not definitely determined. Larvæ occur scatteringly—not in apparent colonies like the allies, and have been met with but once, at Wilmington, Del.

Mature larva. In life the larva is a unicolorous green, due to the fluid contents of body; the inflated skin is pale brownish. The body is cylindrical and so much slenderer it seems not to be closely related to its allies. Head small, normal, rounded, mottled on occiput, shining yellowish brown; width 1.7 mm. The

shields are of the body tone and are not contrasting. Tubercles well defined, on thoracic joints two and three, Ia, Ib, IIa, IIb and III are about equal and in almost perfect alignment, a trifle oblique to the axis of the body; IV on abdominal segments is about half the size of the spiracle; the latter flattened-elliptical, black-ringed. Crochets of the proleg at joint ten number 22. Length of larva 37 mm.

BUTTERFLY COLLECTING BY SHAH ABBAS THE GREAT

Sir Anthony Sherley, an English navigator who visited Persia in 1599 and was received hospitably by Shah Abbas the Great writes as follows of his conversation with the king, the account having been taken from "A briefe Compendium of the Historie of Sir Anthony Sherleys Travels into Persia," in the ninth book of "Hakluytus Posthumus or Purchas His Pilgrimes" (vol. VIII, pp. 375-449).

"At Hisphaan, said the King; we shall have leisure both to deliberate and resolve of some good things; and with that called some other, who entertayned him with discourses of Hunting, and Hawking, in which he is much delighted, and useth them with great magnificence; never going to any of those sports, but that he carrieth forth above five hundred Dogs, and as many Hawkes, nothing rising before him but it is game. For Flies, he hath Sparrows; for Birds, Hobbies and Marlins; for the greatest sort, some Hawk or other; and for Roe-deare Eagles; he hath particular Agaes for his Hawkes and Dogs, and other Officers to them a great number."

Robert Burton in his "Anatomy of Melancholy" (1628) refers to Sherley's account thus—"The Persian kings hawk after butterflies with sparrows made to that use, and stares: lesser hawks for lesser game they have, and bigger for the rest, that they may produce their sport to all seasons."—H. B. W.

THE FEMALE OF THE ROACH PARCOBLATTA
CAUDELLI, AND THE OCCURRENCE OF
THE SPECIES ON LONG ISLAND, N. Y.

BY WM. T. DAVIS

STATEN ISLAND, N. Y.

In 1917 Mr. Morgan Hebard published his very useful paper on The Blattidae of North America North of the Mexican Boundary, and there records a roach with short tegmina taken by me at Wading River, N. Y., July, 1914, as a female of *Parcoblatta fulvescens*. In the Journal, N. Y. Ento. Soc., Dec., 1918, the writer recorded *Parcoblatta virginica*, *P. uhleriana*, and *P. fulvescens*, species bearing considerable superficial resemblance to one another, as occurring at Wading River and attracted by the honey-dew of Aphids.

Recently while preparing the manuscript list of the Orthoptera for the New York State List of Insects, it was observed that no males of *fulvescens* were at hand from New York State, but a number of males collected on Long Island having four specialized areas on the dorsal part of the abdomen were present. They could not be separated from *caudelli* Hebard heretofore supposed to be more southern in its range. The female of this species was described in the paper mentioned above as having the tegmina reaching beyond the apex of supra-anal plate; "sustained flight possible."

It was evident that owing to the lack of males of supposed *fulvescens* and females of *caudelli*, that there might be a mix-up, and perhaps after all the females of *caudelli* might have short tegmina and otherwise closely resemble the same sex in *fulvescens*. This now appears to be the case. The range of *fulvescens* is probably not as far to the north as has been supposed, at least none have as yet been collected on Long Island. In the writer's collection there are specimens of both *fulvescens* and *caudelli* from Lakehurst, New Jersey.

The female of *caudelli* may be separated from that of *fulvescens* by its slightly smaller size, by having the discal part of the pronotum darkened instead of almost clear brown, and by the under part of the abdomen being very dark brown instead of light brown. In *fulvescens* the entire under surface is nearly of a uniform color. The abbreviated tegmina of *caudelli* are in shape between those of *uhleriana* and *fulvescens*; they are not as squarely cut off as in the latter, nor as produced and rounded at the outer extremity as in the former.

The females of *uhleriana* and *fulvescens* seem to be much more easily separated than are the males, which can be readily confused. In addition to the inner distal angles of the cerci from the sixth to ninth joints being acutely but briefly produced in male *uhleriana* and not so in *fulvescens*, as pointed out by Mr. Hebard, it may be added that the cerci have a more flattened appearance in *uhleriana*. Also they, and most of the dorsal portion of the abdomen, are usually darker in color than in *fulvescens*.

Pantala flavescens captured by *Anax junius*.

Dr. Wm. H. Wiegmann has given the writer a female *Anax junius* Drury and a female *Pantala flavescens* Fab. collected in the Botanical Garden, Bronx Park, September 3, 1924. The first named dragonfly was seen to capture the *Pantala* in mid-air, and bear it to the ground. It was so intent upon eating the head of its victim that the Doctor secured it with his hands. The writer has seen the somewhat more powerful and longer legged *Anax longipes* catch one of the large species of *Libellula*, but *Anax junius*, in his experience, is generally content with smaller prey than *Pantala flavescens*.—WM. T. DAVIS.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY

MEETING OF MAY 6, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M. on May 6, 1924, in the American Museum of Natural History, President Harry B. Weiss in the chair, with 18 members and eight visitors present.

Mr. R. J. Hunter, present as a guest, offered the use of his telescope facilities in watching the Transit of Mercury on May 7.

Mr. Mutchler spoke on "Beetles of the Galapagos Islands," and exhibited the specimens taken on the expedition in which Mr. Beebe and Dr. Wheeler had taken part. He described the islands in the Pacific Ocean, about 500 miles west of Ecuador, and practically on the Equator, as something like a dump of cinders and poor in beetle life. The species found appeared to have been introduced on floating timber, by winds or by human agency. Collections have been made by Darwin in the "Beagle," by the "Eugenia" in 1852, the "Petrel" in 1875 and the "Albatross" in 1890, previous to the recent expedition. The beetles found have been studied by Waterhouse, Boheman, C. O. Waterhouse and Linell, and the number has grown from 29 found by Darwin to 73 now known.

Mr. J. C. Bridwell read a paper, "Notes on Habits of Chrysomelidæ with a Consideration of Adaptions to Climate," in which details of the life history of *Microrhopala vittata*, *Calligrapha similis* and *elegans*, *Plagioderà versicolor*, *Trirhabda canadensis* and *tomentosa* were given to show that in each case only two to four months were passed in active feeding and growth, the remainder being passed in a dormant state, either as egg, pupa or hibernating adult. The active period occurs during tropical or subtropical heat, for even far north the brief summer is hot. On the other hand, *Spermophilus roborator* and *Bruchus mimus* feed continuously in the warmer regions and conditions under which they occur. The conclusion was that their habits were greatly influenced by climate.

Dr. Lutz said an interesting and thus far unknown feature of the problem was why some species passed the winter as adults and others in different stages.

Dr. Hussey recalled an experience in Minnesota in which *Corixa* frozen in solid ice eight inches thick was killed, but a different species, jammed in numbers in air pockets in the ice, survived.

Mr. William T. Davis reported seeing two Monarch butterflies at Tottenville, Staten Island, May 5, 1924. One, a female, was flying on Ward's Point close to the ground and against a strong westerly wind. She examined all of the recently sprouted plants on the sandy soil, probably searching for

a milkweed. When she came to the end of the vegetation and near the end of the Point, she flew to a height of about 200 feet, reversed the direction of her flight and sailed with the wind in the direction of Long Island. Her progress was rapid, and with a favorable wind it can be easily understood how these butterflies can reach this vicinity from the south in a few days. Today, May 6, a Monarch butterfly was seen at St. George, flying northward, about 20 feet above the tops of the trees. The earliest record for the Monarch butterfly in Staten Island is April 25, 1917; the first week in May being about the usual time of appearance.

After deciding to begin the next and last meeting for the season at six o'clock, with coffee and eatables under the charge of Dr. Lutz, Mr. Angell and Mr. Davis, the Society adjourned.

MEETING OF MAY 20, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M. on May 20, 1924, in the American Museum of Natural History, President Harry B. Weiss in the chair, with 16 members and three visitors present.

Dr. Lutz spoke of the supper which preceded the meeting prepared by the joint efforts of Messrs. Mutchler, Wunder, Davis and Mrs. Timonier, to whom especially the floral decorations, rescued from the Horticultural Exhibit, were due. A vote of thanks was given to them.

Mr. Angell exhibited *Cicindela modesta*, taken at Oradell, N. J., May 18.

Mr. Sherman read a paper on "Entomological and other Bibliographies," praising highly the work done by Mabel Colcord and giving a complete resumé of the subject.

Messrs. Mutchler, Lutz and Bridwell joined in the subsequent discussion.

Mr. Barber read a paper on "Hemiptera of Galapagos Islands," reviewing the results of the Beagle, Eugenia, Challenger, Albatross and Stanford expeditions before describing his own work on the collections made by Beebe's expedition which added 10 to the 22 species previously known, including eight new species. Of special interest were three species of *Halobates* or treaders of the sea which feed on floating dead animal matter.

His remarks were discussed by Messrs. Davis, Mutchler and Bridwell, the latter stating that *Halobates* was occasionally driven on shore at Honolulu.

Mr. Weiss spoke of his visit to Seaside Park on May 7 and the 29 species he had found there on *Hudsonia* and Sand Plum.

Mr. Davis also spoke of beach collecting at Sandy Hook.

MEETING OF OCTOBER 7, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M. on October 7, 1924, in the American Museum of Natural History, President Harry B. Weiss in the chair, with 21 members and three visitors present.

Mr. Mutchler proposed for active membership Mr. Guido Maydell, American Museum of Natural History.

Mr. Leng announced the death on August 7 of Mr. Gustav Beyer. On his motion a committee to draft appropriate resolutions was ordered.

The president announced the subject for the evening "Notes on Summer Experience in Collecting Insects" and called on each member in turn.

Mr. Mutchler spoke of his experiences in going out with Boy Scouts and finding *Cincindela 6-guttata* under bark. He also spoke of his trip to River-ton, N. J., to study the Japanese beetle and exhibited eight bottles containing about a pint, all obtained in about an hour.

Mr. Burns, who had accompanied him, spoke of the devastation of the peach orchards, with photographs showing the beetles thickly clustered on the peaches which were devoured until bare pits remained. Samples of these clinging to the branches were also shown. Mr. Burns showed in addition specimens of *antiopa* caterpillars prepared by a new process preserving color and hairs.

Mr. Hall said he had a successful trip to Wyoming where he had collected many butterflies at and above the tree line. These will be shown at a future meeting.

Mr. Olsen had visited the Bahamas, finding insects scarce amid the scrubby growth on its limestone rock. A large number of micro-lepidoptera were collected at night.

Dr. Lutz exhibited the larviform female of *Phengodes*, wingless and in life provided with series of luminous spots. He gave some details of its effect on photographic plates and spoke also of his experiments in taking motion pictures of insects. Later he spoke of the recurrence of Rocky Mountain migratory locust and Dr. Ball's opinion that it is a winged form of *atlantis*, produced in seasons of drought.

Mr. Woodruff described his method of collecting *Elaphrus* by tramping hard in soft mud on the cattail overgrown bank of a brook. He spoke also of finding *Deronectes depressus* in Connecticut, some in a cold pool shaded by hemlocks, others in a stream meandering slowly through meadows. He had been successful in studying the nymph of *Gomphus adspersus* and at Karner, near Albany, N. Y., had found a new Membracid first noticed in the State Museum Collection. During the summer he had, with pleasure, made the acquaintance of Mr. K. T. Chamberlain, of Cornwall Bridge, Conn., whose ability he praised.

Mr. Davis had spent two weeks in Virginia; the results will be covered later. He exhibited *Melanoplus differentialis*; his remarks thereon will be printed in Short Notes; also *Ceuthophilus gracilipes*, a cave cricket found at Fort Wadsworth, Staten Island, by Lloyd Egbert on September 24, an addition to the list of Staten Island Orthoptera, bringing the total to 101 species. Four pink katydids found this season on Staten Island by various young people were shown and discussed. In butterflies he remarked that the Monarch had not been as plentiful as usual, while the Thistle butterfly, *Vanessa*

cardui, had been relatively abundant; the first was seen on April 5. The death of the *Cychnus viduus* found November 29, 1923, occurred on June 28, 1924. It was fed on molasses during its seven months captivity.

Mr. Sherman had spent his summer in the White Mountains and in visits with Henshaw, Johnson and Banks in Boston; Crampton and Alexander in Amherst; and Parshley in Northampton, where the library excited his admiration. Beetles were scarce in his experience and Mr. Dodge told him the summit of Monroe was now better for collecting than Mt. Washington.

Dr. and Mrs. Hussey had been in Michigan. Mrs. Hussey in pursuit of her studies in Embryology rejoiced in having found the first *Lethocerus americanus* since 1916. She told also of a basket of woven fabric from Africa apparently infested by beetles.

Mr. Shoemaker described visits to the Water Gap and to Washington, the latter with Nicolay and Quirsfeld having been modified by the freshet in the Potomac; however, a dozen or more *Cychnus* and 54 Pselaphids (sifted in three hours) were part of the catch.

Mr. Watson commented on the abundance of *cardui* which began to appear early in April. His opinion was that the abundance was due to migration.

Mr. Bell took the same view of their abundance being due to migration.

Mr. Dow, in attendance after six years absence in California, gave a general account of his natural history observations. He spoke of the scarcity in his observation of *Cicindela* and *Cicada* and told amusing incidents of Road Runner birds, gopher snakes and rattlesnakes.

Mr. Davis said the *Cicada* Mr. Dow had sent him was *Cacama crepitans*.

Mr. Farrelly exhibited pictures of Tampico and Port Arthur and described the jungle behind the oil tanks in which he had collected.

Mr. Levine had circumnavigated the globe but had been unfortunate in meeting the dry season in Java and the South Sea Islands. He had numerous illustrations which, with some of the insects captured, may be shown at a later meeting.

Mr. Schwarz spoke of *Xylocarpa virginica* in building nests in a wooden building.

Mr. Nicolay spoke especially of a visit with Messrs. Quirsfeld and Mason to Skyland, Virginia, and Stonyland Mountain, where five species of Cychnini were found and two interesting weevils. One of these, *Lepidophorus setiger*, was found in abundance in deep layers of leaves. At the summit of the mountain *Centrodera picta* was common on oaks. Mr. Nicolay told also of Mr. Dyar's unusual form of relaxation by constructing tunnels in his garden.

Mr. Leng showed the work of J. L. Padilla in the "California Illustrated Review" in photographing Lepidoptera in conjunction with food plant.

Mr. Weiss said he had visited Seaside Park every week and would later exhibit the insects found there with a discussion of their environment.

MEETING OF OCTOBER 21, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M. in the American Museum of Natural History, President Harry B. Weiss in the chair, with 14 members and 26 visitors present.

Mr. Guido Maydell, American Museum of Natural History, was elected a member of the Society.

Mr. Herbert Eberle, 1592 East 12th Street, Brooklyn, was proposed for active membership by Mr. Mutchler.

Mr. Leng exhibited *Supplementa Entomologica* No. 10, containing Preliminary Checklist of "common names" used in applied entomology.

Dr. Lutz read a paper on Insect Sounds which was followed with close attention and discussed by several members and visitors. The paper will be printed in full.

In the course of the discussion Mr. Davis, being asked to speak, stated that in his long study of Orthoptera in the field, his opinion that their song was a sexual attraction was strongly confirmed by repeated observations.

Mr. Engelhardt, also from field study, believed that, at least in part, their song was an expression of the pure joy of living.

Dr. Lutz having taken the chair, it was voted to omit the Election Day meeting.

Mr. Eberle exhibited a specimen of the Japanese beetle *Popillia japonica* which he had found in the fall of 1923 on Long Island, about two miles north of Coney Island.

The New York Entomological Society

Organized June 29, 1892—Incorporated June 7, 1893

The meetings of the Society are held on the first and third Tuesday of each month (except June, July, August and September) at 8 P. M., in the AMERICAN MUSEUM OF NATURAL HISTORY, 77th Street and Eighth Avenue.

Annual dues for Active Members, \$3.00.

Members of the Society will please remit their annual dues, payable in January, to the treasurer.

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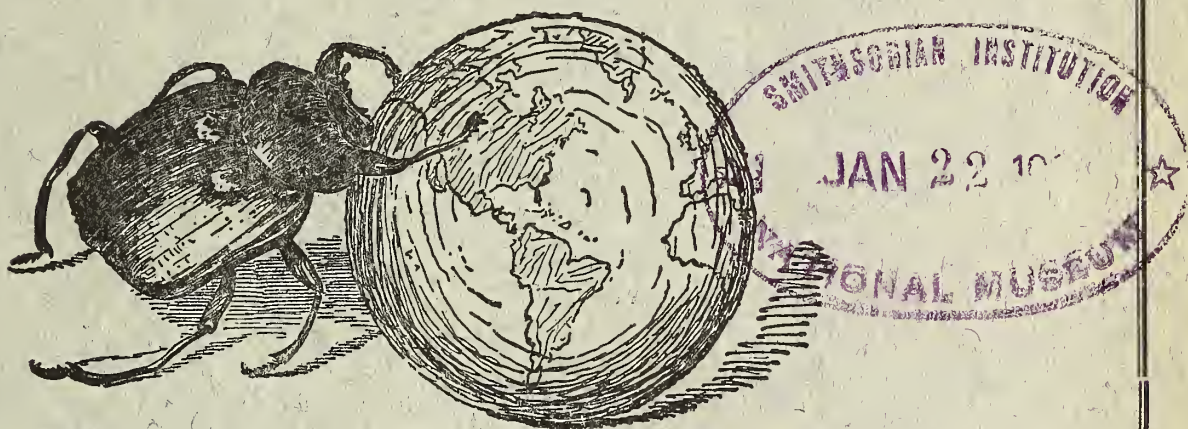
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VOL. XXXIII

DECEMBER, 1925

No. 4

THE SEMINAL RECEPTACLES AND ACCESSORY GLANDS OF THE DIPTERA, WITH SPECIAL REFERENCE TO THE ACALYPTERAE

BY A. H. STURTEVANT

COLUMBIA UNIVERSITY, NEW YORK CITY

INTRODUCTION

It was estimated by Williston (1908) that more than half of the living Diptera belong to the large group that is variously known as Muscidae, Myodaria, Muscoidea, Oligoneura, Eumyiidae, etc. The division of this group into smaller units is an extremely difficult task, though there is fairly general agreement that two main series are present: the Calypterae, Schizometopa, or Thecostomata, and the Acalypterae, Holometopa, or Haplostomata. It is difficult to draw up satisfactory definitions of these series, and there are a number of forms that are near the border-line and may be placed on either side of it. Nevertheless, there is general agreement that the separation into these two series represents a valid and useful conception.

The Acalypterate series includes from twenty to forty more or less generally recognized families, perhaps better called subfamilies. Scarcely any two authors agree either as to the number of these families or as to their limits, and there are current several widely different sequences of arranging them. The older authors classified the group chiefly according to the venation of the wings, the structure of the arista, and the number and

arrangement of the bristles. Loew and others used the structure of the ovipositor in some cases; and Hendel, Czerny and Melander have also used the shape and arrangement of the external sclerites of the head. Frey (1921) has made a detailed study of the mouth-parts, and has contributed a large amount of new and suggestive data. His arrangement of the Acalypteræ families seems to me the best that has yet been proposed, and has been followed in the present paper. The reader is also referred to Frey's paper for a full historical account of the classification of the group.

For some years it has seemed to me desirable to make use of new characters for checking up the existing systems of classification. The careful work of Nonidez (1920) on the internal genital apparatus of *Drosophila* showed that the seminal receptacles were strikingly different from those of the Calypteræ; and the accounts of Wesché indicated differences within the Acalypteræ. My own examination of several species of *Drosophilidæ* suggested that that group was rather uniform, and a dissection of *Leria pectinata* (Helomyzidæ) showed that form to represent a new and quite distinct type. Accordingly it was determined to make a comparative study of the apparatus in all the Acalypteræ of which living females could be obtained. After many of the dissections were made the important early work of Dufour (1851) was examined. This paper furnishes data on several groups that I have not dissected, and greatly increases the available information on many other groups, especially as it gives a comprehensive view of the forms other than Acalypteræ—of which I have examined only a few scattered genera.

Another reason for carrying out a comparative study of the receptacles and accessory glands was that the functions of these parts are only very imperfectly understood. It was hoped that some light might be thrown on this general problem, and that species might be found that would be favorable for further study of the question.

PREVIOUS WORK

The point of departure for all comparative studies on the internal organs of the Diptera is the extensive and painstaking work of Dufour (1851). In the special part of the present paper

Dufour's descriptions of the "appareil séminal et sébifique" of the forms studied by him are incorporated with the material collected by later workers, including myself. The large number of species that he studied, and the way in which later work has verified his findings, will be apparent from that account. There are, however, a few points that should be explained concerning Dufour's descriptions. He called the seminal receptacles and their ducts the "glande sébifique," and the spermathecae themselves the "orbicelles," while the parovarium was termed the "reservoir séminal." That is to say, he reversed the function of these organs as now generally understood. There can now be no question that sperm are stored in the "orbicelles" and not in the "reservoirs séminals," since improved optical apparatus enables us to see the sperm directly instead of inferring its position from the structure of the organs concerned. But, as will be shown below, I am inclined to suppose that Dufour was correct in ascribing a glandular function to the spermathecae. Dufour notes the color of the center of the spermatheca, *i.e.*, of the sac as opposed to its envelop. I have inferred from this as to whether or not the sac is chitinized—a point not specifically stated by Dufour. Wesché (1906) has published the only other extensive account of the internal parts of the female reproductive organs of the Diptera. The parts here discussed were not the primary object of Wesché's study, and his accounts are accordingly incomplete in many respects. His work was done with cleared material, and so only chitinized parts were observed. His data are thus useful to us only in indicating the number and shape of chitinized spermathecae present. In the case of the Ephydridæ he did observe the chitinized ventral receptacles, but owing to failure to trace the soft parts he interpreted them as spermathecae.

Lowne (1890–1895), Cholodkovsky (1909), Pantel (1910), Townsend (1911), and others have studied the Calypteræ in some detail. This literature is summarized briefly in the descriptive portion of the present paper.

Nonidez (1920) has presented perhaps the fullest account of the structure and physiology of these organs, based on *Drosophila melanogaster* Meigen. His conclusions were drawn from exten-

sive dissections, sectioned material, and in vitro studies of freshly dissected specimens. It was this author who first described and correctly interpreted the ventral receptacle.

NOMENCLATURE OF THE FORMS DESCRIBED

I am responsible for the identification of the species that I have myself dissected. In cases where I could not be practically certain of the species I have refrained from applying any specific name at all. These determinations have been made largely by the use of the published synopses of the various groups; but my use of these keys has been controlled by applying them to my own collection of over 8,000 Acalypterate specimens. This collection is fairly extensive for the regions around Woods Hole and New York and for southern Alabama, the three regions where most of the specimens here described were collected, and also contains much material from Europe, California, Cuba, Central America, and elsewhere. In several of the subfamilies—the ones in which are most of the species here described—I have also studied much of the material in the United States National Museum, the American Museum of Natural History, the Boston Natural History Society, the Loew collection at Harvard, the Walker and Williston collections at the British Museum, and the collections of Messrs. J. M. Aldrich and C. W. Johnson.

Dufour's material was identified by Macquart. I have translated these names into modern terminology so far as I was able, using mainly Becker, Bezzi, Kertész, and Stein (1903–1907). In the descriptions I have given the modern term, followed by Dufour's term enclosed in brackets, when the names differ.

The sequence of groups adopted in the descriptive portion of this paper is that used by Williston (1908), except within the Acalypterate group. In the latter forms I have followed Frey (1921), with a few minor changes.

SPERMATHECÆ

The spermathecal ducts arise from the anterior portion of the dorsal wall of the uterus—in fact I have considered their insertion as marking the point of separation for the oviduct and uterus. The ducts usually have internal trachea-like spiral

thickenings lining their lumens, though these are often faint or perhaps entirely absent. Each duct has a thin cellular envelop throughout its length.

The spermatheca itself is usually a more or less spherical, heavily chitinized sac attached to the apex of its duct. The form is, however, variable—it may be cylindrical, telescoped, or cork-screw-like; often the sac is not chitinized (probably in reality only very weakly chitinized); and in some forms there is no special sac at the end of the spermathecal duct. Typically the spermatheca is surrounded by a characteristic envelop of large columnar cells that contain large vacuoles. In those forms that have no differentiated spermatheca these envelop cells still persist as a cap on the end of the duct.

PAROVARIA (= *colleterial glands*)

The parovarial ducts arise from the dorsal wall of the uterus, just posterior (or rarely lateral) to the insertion of the spermathecal ducts.

The parovarium itself is never chitinized; in form it is most often a pear-shaped body with a small lumen, but it may be nearly spherical, long and cylindrical, or may have a more complex form. Its cells are very large and contain vacuoles; but these are easily broken by pressure, the cells then appearing granular. The cells are not columnar as are the spermathecal envelop cells, but are roughly hexagonal in optical section. This peculiarity is sufficient to enable one to distinguish the two organs in almost any dissection.

VENTRAL RECEPTACLE

This organ has been found only in certain of the Acalypterate subfamilies. It arises from the anterior ventral portion of the uterus. In form it varies from a simple pocket in the uterine wall to a very long, fine, and much coiled tube, or a large, heavily chitinized, telescoped pouch. Its structure seems to be of considerable taxonomic importance. The direction in which the tube bends and its degree of chitinization appear to be the two most significant characters for systematic use.

The ventral receptacle was described and figured for certain Ephyridae by Wesché, and was apparently seen in *Piophila*

casei by Dufour (1851). In both of these cases it was identified as a spermatheca. It was accurately described and figured in *Phytomyza* by Miall and Taylor (1907), and was seen but not accurately understood or figured in *Drosophila* by Unwin (1907). In neither of these cases was its function surmised. It was correctly described in detail, and also figured, and its function clearly proved, in *Drosophila* by Nonidez (1920).

In some forms there is a ventral pouch to the uterus that simulates a ventral receptacle; but the two types of organs appear to be very distinct. While the ventral receptacle may lie embedded in the uterine wall, it never has a muscular wall of its own, but is supplied only with a thin cellular envelope. The uterine pouches, on the other hand, have the same type of strongly muscular wall as the uterus itself.

INTRASPECIFIC VARIABILITY IN NUMBER OF SPERMATHECÆ

Nonidez (1920) found occasional specimens of *Drosophila* with three spermathecae, though two is the usual number throughout the Drosophilidæ. I have dissected 330 specimens of various wild stocks of *D. melanogaster*, 321 *D. simulans*, 20 hybrids between these two species, 38 *D. funebris*, 33 *D. immigrans*, and 19 each of *D. busckii* and *D. repleta*. In these series there were two specimens with three spermathecae (one *melanogaster* and one *simulans*); all the others had two spermathecae.

The above totals do not include the data obtained from a certain stock of *D. melanogaster* originally collected in Sweden, nor from several mutant stocks that may be descended in part from the Swedish stock. Eighty-four females of this Swedish stock were dissected, and fourteen of them were found to have three spermathecae. The inheritance of this character is now being studied; only a preliminary account of the race can yet be given. Selection for increased spermatheca-number has been effective in that a race is now established in which from 25% to 75% of the females have three spermathecae, and a few specimens with four have been found. There is evidence that at least two Mendelian genes are concerned in the production of the extra spermathecae, but the genetic analysis is still incomplete.

In some specimens of this race there are only two spermathecae present, but one is distinctly larger than the other, and is shaped as though it were a double organ. In other specimens one spermatheca is normal, but the other is replaced by two small spermathecae attached to a single duct. In still other specimens—apparently those in which the duct branches nearer its base—all three spermathecae are equal in size. Finally, in some specimens there are three equal spermathecae, each with a separate duct, so that there are three distinct ducts opening into the uterus. In those cases in which one spermatheca is clearly doubled, either the right or the left organ may be so affected.

The specimens with four spermathecae have not yet been studied in detail.

The only other species in which variations of this nature have been found is *Psila lateralis* (see the descriptive part of this paper); but in very few species have more than five to ten specimens been dissected. On the other hand, in the cases in which more than one species of a genus has been studied the spermatheca-number of all such species has turned out to be the same. The only exceptions to this rule are *Calobata* and *Limnia*, and in both these genera Dufour examined one of the species while I saw the other, so that the discrepancies may not be real. Further, there are relatively few cases in which variations occur within a family.

On the whole it seems probable that the number of spermathecae is a relatively constant character—though it is clear that results based on one or a very few specimens may at times turn out to be misleading; and, by analogy with other characters, it is likely that some forms will be found much more variable than others. *Psila lateralis* presumably represents such a condition.

DESCRIPTIONS, FORMS OTHER THAN ACALYPTERÆ

TIPULIDÆ. Dufour described *Tipula oleracea* Linné in detail and also figured it. There are three chitinized spermathecae, with separate ducts that unite to form a single long common duct. The two parovaria also have a common duct, opening into the oviduct near the opening of the spermathecal duct. In *Ctenophora* Dufour also reported three chitinized spermathecae.

CULICIDÆ. Dufour described and figured *Culiseta annulata* (Schrank) [Culex]. There are three chitinized spermathecæ with separate ducts, and one large parovarium. Neveu-Lemaire (1902) reported a single spermatheca in *Anopheles*, two in *Mansoniodes*, three in *Culex*. Howard, Dyar, and Knab (1912) described one in *Uranotaenia* and *Aedeomyia*, three in *Mansonia*.

Von der Brelje (1924) has studied several genera, and also discusses the work of Kulagin (1901) and of Macfie and Ingram (1922). There is one spermatheca in *Anopheles* and in *Dixa*, three in *Aedes*, *Corethra*, *Culex*, *Mansoniodes*, *Mochlonyx*, and *Theobaldia*. In *Mochlonyx* the three ducts are entirely separate; in *Mansoniodes* they are not described; in the other four genera two of them are united near the base, and in *Culex* and *Corethra* the third is united to this common duct still further basally. In *Mansoniodes* one spermatheca is smaller than the other two. In all these genera the spermathecæ are spherical and chitinized, but the chitin has small thin spots in it, that appear like holes in *Anopheles*. There is a single parovarium in *Aedes*, *Anopheles*, *Culex*, *Theobaldia*, and *Mochlonyx*; in the last-named genus the gland is forked apically. In *Corethra* there are two parovaria, with a common duct, while in *Dixa* there are two with ducts that are separate apically but join before they reach the uterus. In *Dixa* there is also present a pair of glands anterior to the spermathecal duct. Both the parovarial and the spermathecal ducts open into the posterior region of the uterus in this family, though in the higher members of the order this relation has never been observed. Posterior to these openings there is, in *Aedes*, *Anopheles*, *Culex*, *Mochlonyx*, and *Theobaldia*, a large dorsal pouch of the vagina, which v. d. Brelje calls the bursa copulatrix—though its function is only surmised.

CHIRONOMIDÆ. Wesché failed to find any chitinized spermathecæ in *Chironomus*; he reported three in *Ceratopogon*. Miall and Hammond (1900) described two spherical spermathecæ and a single large parovarium in *Chironomus*.

MYCETOPHILIDÆ. Dufour described a number of members of this family. *Ceroplatus dispar* Dufour has two spermathecæ (ap-

parently not chitinized) and two large parovaria. *Bolitophila fusca* Meigen [*Macrocera hybrida*] has the same number of organs, but the spermathecae are heavily chitinized. *Mycetophila amabilis* Dufour has two spermathecae, not chitinized, and one parovarium. *Sciara ingenua* Dufour has two non-chitinized spermathecae and two parovaria.

BIBIONIDÆ. Dufour reported three chitinized spermathecae in *Bibio marci* Linné. Wesché confirmed this for *B. hortulanus* Linné and *Dilophus febrilis* (Linné). In *Scatopse notata* (Linné) Wesché described and figured a single chitinized spermatheca.

SIMULIIDÆ. Wesché reported a single chitinized spermatheca in *Simulium*.

LEPTIDÆ. Dufour described and figured *Leptis tringaria* Linné. There are three non-chitinized spermathecae, whose ducts are united basally to form a long common duct. There are two long parovaria.

I have examined *Chrysopila* sp. and *Leptis* sp. There are three spermathecae in each species. They are spheroid and heavily chitinized in *Chrysopila*, with the usual type of envelop cells. The three ducts are united basally, and have a common envelop even in the region where they are separate. In *Leptis* the spermathecae are long and narrow, with the lumen scarcely larger than that of the ducts. Each spermatheca is chitinized only in a few small plates near its apex. The spermathecal envelop is unusually thin—scarcely thicker than the envelop of the duct.

STRATIOMYIDÆ. According to Dufour there are three chitinized spermathecae and two parovaria in *Beris vallata* Forster, *Odonomyia tigrina* Fabricius, *Sargus cuprarius* (Linné), *Chrysomyia* sp., and *Pachygaster leachii* Curtis [*Vappo pallipennis*]. In *Ephippiomyia ephippium* (Fabricius) [*Ephippium thoracicum*] there are only two spermathecae. The form of the spermatheca shows great variation from species to species in this family.

TABANIDÆ. There are three small chitinized spermathecae in *Pangonia marginata* Fabricius, *Tabanus bovinus* Linné, *Hæmopotia pluvialis* (Linné), and *H. crassicornis* Wahlberg—the first

two reported by Dufour, the last three by Wesché (both saw *T. bovinus*). In the two species examined by him, Dufour also described two parovaria.

I have dissected *Chrysops* sp. There are three spermathecæ, chitinized apically but not basally. They are long ovoid in shape, and have the usual envelop cells. Sperm were observed in them.

ASILIDÆ. Dufour described the spermathecæ as three chitinized coiled tubes in *Asilus crabroniformis* Linné, *Dioctria nigratarsis* Dufour, and *Laphria fulva* Meigen. He also recorded two parovaria in these forms. I have found similar spermathecæ in *Atomosia* sp., and in *Dasyllis* sp. In two species of *Asilus* they are coiled, but irregularly so and not chitinized. In *Erax* sp., and in *Proctacanthus* sp., they are spherical and chitinized. In all these forms, except *Proctacanthus*, three spermathecæ were seen. In *Proctacanthus* only two were seen, but only one poor dissection was obtained, so a third is probably present. It may be noted that Wesché stated that he had found three globular spermathecæ in the family—genus not specified.

THEREVIDÆ. Dufour described three non-chitinized spermathecæ in *Thereva* spp., but only two in *Psilocephala ardea* Fabricius [*Thereva confinis*].

SCENOPINIDÆ. Dufour described and figured *Scenopinus fenestralis* Linné. There are two spermathecæ, each with a long coiled duct, the two coils apparently being separate. Each spermatheca is adherent to the single parovarium.

BOMBYLIIDÆ. Wesché stated that *Comptosia ocellata* has spermathecæ similar in number and arrangement to those of the Tabanidæ. Dufour described three chitinized spermathecæ and two parovaria in *Bombylius major* Linné, *B. cruciatus* Fabricius, *B. minor* Linné, *Systoechus ctenopterus* Mikn [*Bombylius*] and *Usia aenea* Rossi. In *S. cruciatus* there is also a pair of long slender tubes attached just posterior to the parovaria. I have myself observed three coiled chitinized spermathecæ in *Systropus macer* Loew, suggestive of the type found by Dufour in the

Asilidæ. However each spermatheca here has a separate series of coils, whereas Dufour's figure shows all three coiled together in *A. crabroniformis*. In *Systropus* there is a common envelop for the three spermathecæ. Active sperm were found in the basal portions of the spermathecæ.

EMPIDIDÆ. Dufour recorded a single spermatheca and two parovaria in *Empis livida* Linné, *E. unicolor* Brullé, and *Ramphomyia sulcata* Meigen. Wesché also stated that he had observed only one spermatheca in the family.

DOLICHOPODIDÆ. Wesché failed to find the spermatheca, since it is not chitinized. Dufour described and figured it for *Dolichopus nitidus* Fallén. There is a single organ consisting of a non-chitinized bulb, attached to a long slender duct that is coiled into a spool-like form. Two parovaria are present. I have examined an unidentified species of *Dolichopus*, and can confirm Dufour's account of the spermatheca, though my species differed in having a conspicuous transverse constriction in the spermatheca itself. I have also observed active sperm in the portion of the organ basal to the constriction. The long duct has, at least in the greater part of its length, two longitudinal ribs on opposite sides, which give it the appearance of two fused ducts. I am disposed to conclude that such is really its nature. I have also dissected specimens of the genera *Gymnopternus*, *Hydrophorus*, *Paraclius*, *Pelastoneurus*, *Sciapus*, and *Thrypticus*. All these agree in having a single non-chitinized spermatheca. The duct is coiled in *Gymnopternus* and *Paraclius*. In *Sciapus* it is quite short; in *Pelastoneurus* it is much larger at the base, and is less so in *Dolichopus* and in *Paraclius*. The spermatheca itself is a simple sac in *Sciapus*; dumb-bell shaped more or less as in *Dolichopus*, in *Hydrophorus*, *Paraclius*, and *Pelastoneurus*. In *Thrypticus* there is no constriction, but there appears to be a basal and an apical chamber. Sperm were seen in the organ in *Gymnopterus*, *Hydrophorus*, *Pelastoneurus*, and *Sciapus*. It seems likely that the spermathecæ of this family would repay careful study.

PHORIDÆ. Wesché failed to find any spermathecæ here. Dufour found in *Phora abbreviata* v. Roser [*sordidipennis*] a single non-

chitinized spermatheca and two parovaria. I have observed the same relations in two species of *Aphiochæta*. Sperm were present in the spermatheca.

LONCHOPTERIDÆ. Wesché failed to find the spermathecæ, but they were described and figured in the same year by de Meijere (1906). In *Lonchoptera lutea* Panzer and *L. furcata* Fallén, de Meijere found two ducts, each with a border of large cells at its apex, forming a cylindrical envelop. In *L. lutea* the duct is long and slender, and sperm were found throughout its length. In *L. furcata* the whole organ was smaller, the duct shorter, and sperm were never found. *L. furcata* appears to reproduce parthenogenetically and de Meijere believed the spermathecæ to be rudimentary organs.

PLATYPEZIDÆ. I have dissected *Platypeza* sp. It has three spherical chitinized spermathecæ, with the usual envelop cells and with rather long ducts that are entirely separate.

SYRPHIDÆ. Dufour described and figured *Volucella zonaria* Poda and *Eristalis tenax* (Linné). In both there are three spherical chitinized spermathecæ with long ducts and two parovaria. *Eristalis* is unique in that the parovaria are much branched. Wesché also recorded three chitinized spermathecæ in *E. tenax* and in *Syrpitta pipiens* Linné. I have studied *Criorhina decora* (Macquart), *Eristalis aeneus* (Scopoli), *E. arbutorum* (Linné), *Ferdinandea dives* (Osten-Sacken), *Helophilus similis* Macquart, *Melanostoma mellinum* (Linné), *Mesogramma marginata* (Say), *Paragus* sp., *Pipiza pistica* Williston, *Platy-chirus* sp., *Rhingia nasica* Say, *Sericomyia chrysotoxoides* Macquart, *Sphærophoria* sp., *Syrphus* sp., and *Xylota ejuncida* Say. In all these the spermathecæ are three in number. They are chitinized in all but *Helophilus* and *Xylota*; spherical in all except *Xylota*, but drawn out into a chitinized stalk in *Sphærophoria*. In *Xylota* it is probably best to describe the spermatheca as spherical, but just basal to it the duct is much swollen, forming a cavity somewhat larger than that of the spermatheca itself. The apical region is surrounded by typical envelop cells, while the cells around the basal swelling rather resemble paro-

varial cells. The only other unusual relation of envelop cells found in this family is that occurring in *Eristalis* and *Helophilus*, where the spermathecae are covered with a very thin layer of cells, while the duct just basal to them is surrounded by a layer of typical large envelop cells. In *Criorhina* one spermatheca is much smaller than the other two; elsewhere the three are equal in size. In *Criorhina*, *Ferdinandea*, and *Sericomyia* the chitin of the spermatheca is perforated by numerous small holes; in *Melanostoma* it is covered with small papillae; in the other forms with chitinized spermathecae the surface is smooth and not perforated.

The spermathecal ducts are entirely separate in *Criorhina* and *Pipiza*, and probably so in *Xylota*. In *Eristalis* they are separate, but two of them are enclosed in a common envelop from their bases to the point where the shifted spermathecal envelop begins. The ducts were not studied in *Helophilus* or *Sericomyia*; in all the other eight genera two of them unite basally, so that only two ducts enter the uterus. This fusion is very near the base in *Sphærophoria*, but in all the other forms the fused portion is at least as long as either separate branch. In *Paragus* the entire duct is relatively short, and is much thickened basally. Sperm were noted in the spermathecae of *Helophilus*, *Paragus*, *Rhingia*, and *Sericomyia*.

Parovaria were observed only in *Ferdinandea*, *Platychirus*, and *Syrphus*. In all three forms they were long and unbranched. Two were found in *Syrphus* and probably in *Platychirus*, only one in *Ferdinandea*. It is possible that two occur in all the forms studied, since the long telescoped ovipositor made it difficult to dissect such a delicate organ as this.

CONOPIDÆ. Dufour described *Myopa dorsalis* Fabricius [*ferruginea*] and *Physocephala rufipes* Fabricius [*Conops*]. In each there are two spermathecal ducts, each of which bears two chitinized spermathecae. Two parovaria also occur in each species. Pantel (1910) also stated that the members of this group have two ducts, each with twin spermathecae. I have observed the same relation in *Zodion* sp., the only Conopid I have dissected.

ÆSTRIDÆ. According to Wesché there are two spermathecæ in *Gastrophilus equi* (Clark). These, as also the two parovaria, had already been observed by Dufour.

MUSCIDÆ CALYPTERATÆ. A full account of the reproductive organs of *Calliphora erythrocephala* Meigen is given by Lowne (1890-1895), and of *Musca domestica* Linné by Hewett (1914). Dufour, Wesché, Cholodkovsky (1909), Pantel (1910), Townsend (1911), and Minchin (1905) have described numerous other Calypteræ. It appears from these accounts that there are commonly three chitinized spermathecæ with separate ducts (*Echino-myia*, *Gonia*, *Gymnosoma*, *Phasia*, *Winthemia*, *Helicobosca*, *Dexia*, *Prosenia*, *Sarcophaga*, *Lucilia*, *Calliphora*, *Mesembrina*, *Musca*, *Rhyncomyia*, *Aricia*, *Ophyra*, *Lispa*, *Anthomyia*, *Homalomyia*, *Pegomyia*, etc.). Only two are reported in *Siphona* spp. and in the group of *Stomoxyiidæ* (*Stomoxys*, *Hæmatobia*, *Glossina*). Pantel described only one in *Tachina* [*Chætotachina*]. In all cases reported there are two parovaria, except in *Aricia urbana* Meigen, [*Mydæa*], which according to Dufour has three. I have found three chitinized spermathecæ with separate ducts in *Fucellia* sp., which is usually placed in the family Anthomyidæ, but shows points of resemblance to the Cordyluridæ.

In *Musca domestica* there are two small pouches arising from the anterior ventral portion of the uterus; apparently these are useful during copulation.

As is well known, numerous forms among the Calypteræ are viviparous. Since in the majority of the Diptera there is only space for a single egg in the uterus, it is evident that there must be present some different arrangement in those forms in which numerous larvæ develop at once within the body of the mother. Dufour showed that in the viviparous Tachinidæ examined by him the uterus itself is enlarged and contains the developing eggs and larvæ; in *Sarcophaga* two large pockets are given off from the uterus, and here the developing eggs and larvæ are to be found. These have been studied in detail by Cholodkovsky (1909). Pantel (1910) and Townsend (1911) have dissected large numbers of Calypteræ, and Townsend has proposed a general scheme of classification of this group based chiefly on charac-

ters of the internal genital apparatus of the females. These papers contain a very great amount of valuable data; but for our present purpose they are chiefly useful in showing that at least that part of the group studied by Pantel and Townsend (*i. e.*, excluding the Anthomyiidae) is remarkably uniform with respect to the characters that have proved useful in working over the Acalypteræ.

The above account of the Calypteræ does not include the Cordyluridae, which have been commonly referred to the Acalypteræ, but seem to me to be best placed near the Anthomyiidae. They may now be discussed. Wesché reported three chitinized spermathecæ in *Scatophaga lutaria* (Fabricius) and in *S. stercoraria* (Linné). In the former they are telescoped at the base; in the latter they are cylindrical with spiral striations, like those of *Lonchæa* or *Leucophenga*. I have examined *Cordylura* sp., *Parallelomma* sp., *Scatophaga furcata* (Say), and *S.* sp. All four forms have three chitinized spermathecæ, with spiral striations. In *Parallelomma* there is an apical unstriated region; in *Scatophaga* sp. there is a deep apical invagination. In all of these species there are three short ducts, entirely separate to their bases. This last character furnishes confirmation for the view that the group should be placed with the Calypteræ rather than with the Acalypteræ.

Two parovaria occur in *Cordylura* and in *Parallelomma*. In the former they are about four or five times the length of a spermatheca; in the latter they are spheroid and slightly shorter than a spermatheca. Two parovarial ducts were found in *Scatophaga furcata*, but the organs themselves were not seen. In *S.* sp. only one parovarium was found. It was ovoid, and slightly larger than a spermatheca. No sperm nor ventral receptacles were found in this group.

HIPPOBOSCIDÆ. According to Berlese (1909) there are two branched parovaria in *Melophagus*. No spermatheca nor ventral receptacle is present, the sperm lying in the oviduct itself. A separate copulation is required to fertilize each egg.

ACALYPTERÆ

MICROPEZIDÆ. Dufour recorded *Calobata cothurnata* Panzer as having two spermathecæ, apparently not chitinized, and with

long ducts. I have studied *Calobata univitta* Walker. There are three chitinized spermathecæ, that are pear-shaped, each with a small indentation at the apical (broad) end. Two of them are attached to a common duct, and this fact probably led Dufour to report them as a single organ. As will soon appear, the attachment of two spermathecæ to a single duct (which has already been described in the Syrphidæ) is very common in the Acalypteræ. In *Calobata*, as in most of the other Acalypteræ in which the relation occurs, the common duct branches just basal to the spermathecæ, so that their envelopes are closely apposed.

CHLOROPIDÆ. Subfamily Chloropinæ. Wesché failed to find any chitinized spermathecæ in this subfamily. I have examined *Chloropisca glabra* (Meigen), *Diplotoxa (versicolor* Loew?), and *Meromyza pratorum americana* (Fitch). All three have two rudimentary spermathecæ attached to long fine ducts, two rather long narrow parovaria tapering gradually to their insertions on the uterus, and a single non-chitinized pocket-like ventral receptacle that has its blind end anterior to its opening into the uterus. In *Chloropisca* and *Meromyza* the spermathecæ are adherent, each to the mesial surface of the corresponding ovary. In the former the organ consists of a continuation of the narrow duct, loosely twisted, and bordered (on one side only) by a row of the usual columnar envelop cells. In this form the basal portion of each spermathecal duct is enlarged for a distance about equal to the length of a parovarium. Active sperm were seen in these basal enlargements and in the ventral receptacle, but not elsewhere. In *Diplotoxa* and *Meromyza* there is a minute spherical mass of chitin at the apex of each spermathecal duct, and the envelop cells are arranged radially about this mass, to form a small sphere. There are no basal thickenings in the spermathecal ducts. In *Diplotoxa* sperm were found in the ventral receptacle and not elsewhere.

SUBFAMILY BOTANOBIINÆ. I have examined *Botanobia coxendix* (Fitch), *B. frit pusilla* (Meigen), *Crassiseta* sp., *Hippelates flavipes pusio* (Loew), *H. nitidifrons* Malloch, *H. texanus* Malloch, *Melanochæta (longula* Loew?), and *Siphonella oscinina* (Fallén). All of these forms have two rudimentary spermathe-

cæ as in the Chloropinæ, and also a ventral receptacle that is of the same type as that of the Chloropinæ. A single parovarium was found in *Botanobia* (both species), the single gland resembling the two of the Chloropinæ. In *Melanochæta* and *Siphonella* two parovarial ducts were observed, but the organs themselves were not found. In the other forms no parovaria were detected, but at least one was probably present. The most striking characteristic of this subfamily is that the two very fine spermathecal ducts are (in all the species dissected) rolled into a single heavy spool-like coil, within which lie the spermathecæ themselves. No trace of such a coil was seen in the Chloropinæ, but it is characteristic of the Milichiidæ. Sperm were found only in *Crassiseta*, where they were in the ventral receptacle, and in *Hippelates nitidifrons*, in which they were present in the basal portion of the spermathecal duct, though there is no basal enlargement corresponding to that of *Chloropisca*. The chitinized core of the spermatheca is always very small, and has little if any lumen. It is spherical in *Botanobia*, pear-shaped in *Siphonella*, a short cylinder in *Hippelates*, spheroidal and with a much roughened surface in *Crassiseta* and *Melanochæta*.

MILICHIIDÆ. I have examined *Desmometopa m-nigrum* (Zetterstedt), *Mallochiella halteralis* (Coquillett), *Milichiella lacteipennis* (Loew), *Paramyia nitens* (Loew), *Pholeomyia indecora* (Loew), and *Phyllomyza* sp. In all of these there are two very long fine spermathecal ducts, and these are rolled into a single spool-like coil that is usually somewhat looser than that found in the Botanobiinæ, but nevertheless reminds one of that subfamily. The spermathecæ themselves have been seen only in *Mallochiella* and *Pholeomyia*. In both forms they are two in number, and each consists of a slender very weakly chitinized tube—merely a continuation of the duct—surrounded in a single plane by the usual columnar envelop cells. The whole organ thus has a feather-like appearance. Parovaria were found only in *Mallochiella*, where two are present. The ducts have internal spiral thickenings that are much more conspicuous than those of the spermathecal ducts. The duct is shorter than the gland, which is about the length of a spermatheca, and is roughly cylindrical in shape, tapering to its base.

The above account was drawn up from fresh dissections, in which neither sperm nor ventral receptacles were found. Both were, however, discovered in fixed and sectioned material of *Milichiella*. The ventral receptacle is non-chitinized, and is evidently the functional sperm-reservoir. It is probably present also in the other members of this subfamily.

AGROMYZIDÆ. Miall and Taylor (1907) described *Phytomyza aquifolii* Goureau. There are two spherical spermathecae, and two parovaria. The ventral receptacle was also described and figured. The figure agrees well with that given here for the same genus, and the authors also made out that the sac opened into the ventral wall of the uterus. They concluded their account of it thus: “. . . we are unable to explain the function of this organ.”

I have examined *Agromyza* spp., *Cerodonta dorsalis* (Loew), and *Phytomyza* sp. In all three genera there are two nearly spherical chitinized spermathecae, two parovaria, and a chitinized ventral receptacle. Sperm have been found in the spermathecae of *Agromyza* and *Cerodonta*, and in the ventral receptacle of the latter. The parovaria, in all three genera, consist of a short basal duct, containing an internal spiral thickening, then a fairly large, thin-walled spherical sac. The apical portion of the organ consists of an irregular weakly chitinized duct, surrounded by very large cells that contain huge vacuoles. This portion is somewhat longer than all the rest of the parovarium taken together. The ventral receptacle of *Cerodonta* is a simple pocket, horse-shoe-shaped when seen from the side, with the opening at the posterior end and with the blind anterior end somewhat enlarged. In *Agromyza* and in *Phytomyza* the opening is also posterior. The structure is similar in the two genera, and may be understood from the figure as well as from a description. This receptacle lies embedded in the ventral wall of the uterus. A similar organ occurs in *Phytomyza bicolor* Coquillett, of which I have a cleared preparation.

In *Cerodonta* the two spermathecal ducts fuse near their bases to form a short common duct that is broader than either single duct. This relation seems not to occur in the other two genera.

LONCHAEIDÆ. According to Dufour, *Palloptera ustulata* Fallén [*Sapromyza*] has three chitinized spermathecæ. Wesché recorded two for *Lonchæa* sp. I have examined *Lonchæa polita* Say and *L.* sp. In each species there are three chitinized spermathecæ that are cylindrical and have spiral ridges like those of the Cordyluridæ or of *Leucophenga*. In *L. polita* there are only two ducts, the right one being branched at its apex to bear two spermathecæ. In the undetermined species there are only two ducts at the base, but one of them branches very near the base—so that this species comes nearer having three separate ducts than any other Acalypterate yet observed. Two parovarial ducts were observed in this form, but the glands themselves were not seen in either species. A chitinized ventral receptacle is present in each species. In *L. polita*, where a better dissection was obtained, it is retort-shaped, and lies embedded in the unusually thick muscular ventral wall of the uterus. Sperm were found only in the unidentified species, where they were in the spermathecæ.

ORTALIDÆ. I have dissected *Melieria similis* Loew. There are three chitinized spermathecæ, resembling those of *Lonchæa*, and attached to two ducts as in *L. polita*. Owing to the heavily chitinized ovipositor, dissection is very difficult in this and related families. For this reason the ventral receptacle remains uncertain, though probably a weakly chitinized one was present. Sperm were not found.

CEPHALIIDÆ. I have a cleared preparation of *Camptoneura picta* (Fabricius) that shows three chitinized spermathecæ. It is likely from their position that two of them arise from a common duct, but the ducts are not visible.

PLATYSTOMIDÆ. Dufour's account of *Platystoma umbrarum* Fabricius gives that species two rather long tapering parovaria, and three chitinized spermathecæ. Dufour also figured three spermathecal ducts that enter the uterus separately. This latter observation can hardly be accepted until verified, since such a relation has not been observed in any other undoubted Acalypterate. It does not occur in the only Platystomid that I have

examined—*Rivellia viridulans* Desvoidy. In this form there are three chitinized spermathecae, each of which is spherical but strongly telescoped basally—closely resembling the form characteristic for *Drosophila*. The spermathecal ducts are two in number, and each has a conspicuous oval swollen region just basal to the spermatheca. One of them branches apically from the swelling, to bear two spermathecae. Difficulty of dissection prevented any satisfactory attempt to see if a ventral receptacle is present.

ULIDIIDÆ. Wesché figured three chitinized spermathecae for *Ulidia nigripennis* Loew (stated by Collin (1910) to be really *U. erythrophthalma* Meigen). These were telescoped at the base. Wesché also figured the spermathecae of *Seoptera vibrans* (Linné). These were four in number, but only two ducts were present, each bearing two spermathecae at its apex. Dufour described and figured *Chrysomya demandata* (Fabricius) [*Ulidia*]. There are three spherical chitinized spermathecae, two of them arising from a common duct, and two pear-shaped parovaria with long fine ducts.

I have dissected *Chaetopsis aenea* (Wiedemann), *C. apicalis* Johnson, *C. fulvifrons* (Macquart), *Chrysomya aenea* Wiedemann, *C. demandata* (Fabricius), *Eumetopiella rufipes* (Macquart), *Seoptera vibrans* (Linné), and *Stenomyia tenuis* Loew. My observations on *Chrysomya* and *Seoptera* agree with those of Dufour and Wesché, except that in *Seoptera* I have also seen two parovaria, and a suggestion of a brownish ventral receptacle. In all the other forms studied there are only two chitinized spermathecae, more or less spherical in shape. Sperm were found in the spermathecae of *Chaetopsis apicalis*, *Eumetopiella*, and *Stenomyia*. Two rather long parovaria with very fine ducts were found in *Chaetopsis aenea* and *C. apicalis*, while in *Eumetopiella* and *Stenomyia* only a single small gland was seen—though the difficulty of dissection is so great that it is quite likely that two are present. Because of this same difficulty it is probably not significant that no trace of a ventral receptacle was found except as noted above for *Seoptera*; sections have in fact shown that *Chaetopsis* has a non-chitinized ventral receptacle, in which sperm were present.

PTEROCALLIDÆ. I have examined *Callopistromyia annulipes* (Macquart) and *Pseudotephritis vau* (Say). In each there are three spherical chitinized spermathecæ, attached to two ducts. No sperm nor ventral receptacles were found, but the latter may have been present and not chitinized. *Pseudotephritis* has two rather long cylindrical parovaria, and a large heavy-walled uterus like that of the Lonchæidæ or Sapromyzidæ.

TEPHRITIDÆ. I have a cleared preparation of *Ensina picciola* (Bigot), and have dissected *Euaresta bella* Loew, *Eurosta comma* (Wiedemann), *Neaspilota achilleæ* Johnson, *Procecidochares* (*Oedaspis*) sp., *Straussia longipennis* (Wiedemann), *Terellia palposa* (Loew), *Trypanea daphne* (Wiedemann), and *Zonosema flavonotata* (Macquart). In all these there are present two pear-shaped chitinized spermathecæ. They bear small knobs in *Euaresta*, and numerous larger papillæ in *Procecidochares*. In *Terellia* there are enlargements of the ducts just basal to the spermathecæ and about the same size as a spermatheca. The only sperm found in the group were in these enlargements. The ducts are long and fine, but with heavy envelopes, in all the forms dissected. No ventral receptacle has been definitely observed in dissections, but it is probable that a very weakly chitinized one is present in *Neaspilota* and *Straussia*, while sections of *Euaresta* show a non-chitinized one, with the apex directed anteriorly and with sperm present. The organ is probably present in the rest of the group, but was not found because of the difficulty of dissection characteristic of this and the preceding seven families. Two parovaria were found in *Neaspilota*, *Procecidochares*, *Straussia*, and *Terellia*. In *Zonosema* and *Trypanea* only one was found but a second was perhaps present. In *Neaspilota* and *Procecidochares* they are long, with a thin-walled spherical enlargement suggestive of that found in the Agromyzidæ. In the other forms named the parovaria are spherical or pear-shaped.

(To be continued)

A NEW NORTH AMERICAN NECROPHORUS¹

BY MELVILLE H. HATCH

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AND

JOHN W. ANGELL

NEW YORK CITY

Necrophorus hybridus new species.

Thorax transversely cordate, widely margined, with deeply impressed anterior sinuate line, glabrous, disc finely punctate (as in *marginatus* and *obscurus*); antennal club orange with first segment black; posterior tibiae straight; hypomera orange; elytra bifasciate, very nearly as in certain forms of *marginatus*; fasciae continuous laterad with hypomera; along the lateral margin of the elytral disc between the fasciae the orange area extends slightly mesad of lateral margin of disc; anterior fasciae attaining scutellum and suture; posterior fasciae not attaining suture, and presenting the trilobed appearance at free mesal end exhibited by *marginatus*, *obscurus*, *guttulus*, and *pustulatus*. Length of elytra 12 mm.; total length, 26 mm. Aweme, Man., July 27, 1904 (Criddle).

Paratypes: length of elytra 7–13 mm.; total length 17–30 mm.; the posterior fasciae attain the suture in some specimens: Manitoba; Aweme, Man. (Criddle): July 4, 1904, Aug. 12, 1911, Aug. 15, 1915, July 27, 1906 (2), Aug. 11, 1905, Sep. 10, 1908, July 14, 1909, Sep. 10, 1905, July 12, 1909; Springdale, Wash., Sep. 8, 1920 (F. N. Blanchard, from garbage heap); N. J., Sep.; Rio Grande River, N. Mex., July 21, 1902 (Osler).

This species was detected some years ago by Mr. Angell. The type and paratypes are in the Hatch collection.

¹ A contribution from the Zoological Laboratory of the University of Michigan.

HABITATS OF COLEOPTERA¹

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An attempt is made below to distinguish the principal coleopterous habitats in terms of some of the immediate factors that determine the local distribution of a beetle fauna. The relationships involved are fundamental to but by no means identical with the further problem of ecological succession. The different stages in the ecological successions contain the species they do because of the conditions involved.

The fetish of a uniform terminology has not prevented the adoption of old terms, when such are at hand. Terms ending in "phagous" (as coprophagous, phytophagous, etc.) have been rejected as unavailable because they involve food relationships. Not all species inhabiting dung and plants feed upon the substratum, but some may be predaceous. The suffix "bious" (Greek βιώω, I live) implies only so much as is usually observed, the presence of the species in the habitat.

List of Habitats

A. Associated with the physical environment.

1. Geobious or ground habitat.
2. Aquatic habitat.
3. Cavernicolous or cave habitat.

B. Associated with living organisms.

4. Phytobious habitat, associated with green plants.
5. Mycetobious habitat, associated with fungi.
6. Termitophilous and myrmecophilous habitats.
7. Parasitic habitat.
8. Edificarian habitat, associated with the habitation of man.

¹ A contribution from the Biological Laboratory of the James Millikin University, Decatur, Illinois.

C. Associated with disintegrating organic remains.

9. Saprobious habitat, associated with dead or decaying vegetable matter.
10. Carpobious habitat, associated with fermenting fruit, sap, etc.
11. Xylobious habitat, associated with dead and decaying trees and wood.
12. Coprobious or dung habitat.
13. Necrobious or carrion habitat.

With the exception of the cavernicolous and edificarian, these habitats cut across rather than parallel ecological communities, and constitute consocieties and strata of several associations (Shelford, 1913, p. 37). On the other hand both cavernicolous and edificarian habitats contain species that might with equal propriety be otherwise classified: as geobious, coprobious, etc., in the case of the cavernicolous species; as saprobious, necrobious, etc., in the case of edificarian species. The termitophilous and myrmecophilous species among those living in habitats associated with living organisms, and practically all those living in habitats associated with disintegrating organic remains, together with the strictly geobious species, belong to the several consocieties or minor communities of the ground strata, and may occur in any of the associations except the aquatic. Exceptions to this are (1) guests of arboreal ants and termites, (2) mycetobious and xylobious species on or in trees that are still standing, and (3) possibly species of various relationships in the habitations of arboreal mammals or birds.

Species occur in a habitat for one of several reasons. (1) In the case of habitats associated with living or dead organic matter, the species may be feeding directly on the organic substratum. (2) The species may feed on other animals, or, as in the ambrosia beetles, on fungus living on the substratum. (3) The species may seek the situation for purposes of temporary shelter, (4) pupation, (5) copulation, or (6) oviposition. (7) The occurrence may be purely adventitious. Of especial importance among those species associated with living organisms is the phenomenon of specificity or the limited occurrence of the species

of parasite, used in the broad sense, on one or a few species of host.

1. Geobious habitat. Depending apparently on the amount of moisture and the nature of the substratum, at least five divisions of this habitat may be indicated. The conditions described were noted particularly on Beaver Island, Michigan, in the course of a coleopterological survey made for the Department of Conservation of the State of Michigan in 1922.

(1) The littoral habitat involves the strip of wet sand or mud along the strand line of lakes and ponds. It merges with the subaquatic littoral habitat on the one hand and the adjacent geobious habitat on the other. (*Stenus stygicus* Say, etc., *Bembidion*, especially the subgenus *Notaphus*, as *patruele* Dej., *cordatum* (Lec.), *versicolor* (Lec.), *variegatum* Say, etc., *Heterocerus*, *Omophron*, *Patrobus*, *Dyschirius*, *Georyssus*.)

(2) The beach habitat involves forms flying on the beach (*Cicindela repanda* Dej., *Bembidion carinula* Ch.) and forms under cover on the damp sand (*Bembidion transversale* Dej., *Agonum errans subcordatum* Lec., *Chlaenius brevilabris* Lec., *C. solitarius* Say, etc.).

(3) On dry sand of pine barrens under cover (*Harpalus erraticus* Say, *Celia musculus* (Say), *Cymindis pilosa* (Newm.)).

(4) On dry hard ground, under cover, such as occurs in the vicinity of cultivated fields, pastures, grassland, and high open woods (*Harpalus pennsylvanicus* DeG., *H. caliginosus* (Fab.), *Poecilus lucublandus* Say, *Calosoma calidum* Fab., etc.).

(5) On damp ground or humus, under cover, in low woods, margins of bogs, etc. (*Euferonia coracina* (Newm.), *Sphaeroderus lecontei* Dej., etc.).

2. Aquatic habitat. Aquatic Coleoptera do not represent a very extensive occupation of aquatic habitats, due to the fact (1) that the larvae on the whole must come to the surface for air (gyrinid and dryopid larvae possess gills, and very small larvæ may be able to effect an exchange of gases with the surrounding water directly through the body wall), (2) most forms must come to shore to pupate, (3) the adults are air breathers. The following habitats may be distinguished.

(1) The subaquatic littoral habitat, just below the water line, is inhabited by such species as *Laccobius agilis* Rand. It merges with the littoral habitat.

(2) The pond habitat contains the majority of aquatic Coleoptera. The surface and margins are readily accessible from all portions of the habitat. Such situations are ponds, pools, bogs (adults at least can withstand a considerable variation in hydrogen ion concentration), vegetation grown margins of small lakes, protected coves of larger lakes, and still coves and pools of streams and rivers.

(3) Rapids and running water habitats contain species of Dryopidæ and Elmidæ on the under side of stones and a few Dytiscidæ (Shelford, 1913, p. 102) that bury themselves in the sand of the bottom. Elmids have been found on the under side of stones on wave-swept beaches, where conditions are similar to those in rapids (ibid, p. 78).

(4) Surface habitat (Gyrinidæ), which may be divided into standing and slowly running water, with species peculiar to each.

(5) Submerged vegetation. This situation is practically uninhabited by Coleoptera, due to the difficulty the animals would have in coming to the surface. At Third Sister Lake, near Ann Arbor, Michigan, I found *Dineutus* larvae and adults of *Bidesus flavicollis* Lec. in such a situation.

3. The cavernicolous habitat is typically represented by blind silphids and carabids, but species with eyes belonging to numerous groups are likewise known.

4. Phytobious habitat. The great host of species associated with green plants may be subdivided into several groups. Many of the species, especially those feeding on the substratum, are specific in distribution.

(1) Phyllobious species, or species associated with foliage. They may be either phyllophagous (Chrysomelidæ, etc.) or predaceous (Coccinellidæ, etc.). Leaf mining species constitute a distinct division of this group.

(2) Antheobious or flower inhabiting species (adults of Mordellidæ, Cerambycidæ, etc.).

(3) Spermbious or seed inhabiting species (Mylabridæ).

(4) Histobious or tissue inhabiting species (curculionid larvae).

(5) Dendrobious or tree-trunk inhabiting species (Cerambycidae, Buprestidae, Ipidae and their guests, etc.). Ipsids may either feed directly on the substratum of the wood or on a fungous growth that lines their burrows. The ipid guests are mostly predaceous. This habitat merges with the xylobious or decaying wood habitat. Blackman (1924) divides the habitats of the tree into (1) lower trunk, (2) upper trunk, above the first branches, and limbs over two and one-half inches in diameter, and (3) smaller branches and twigs.

5. Mycetobious habitat (Staphylinidae, Erotylidae, Mycetophagidae, etc., inhabiting fungi). The close relationship between fungous tissue and disintegrating organic matter is exhibited by the occurrence of the following forms in fungus (Weiss and West, 1920): *Cercyon*, *Necrophorus*, *Staphylinus*, *Philonthus*, *Hister interruptus* Beauv., etc., *Nitidula*, *Gleichschrochilus*, *Onthophagus*, and *Geotrupes*.

6. Termitophilous and myrmecophilous species (Histeridae, Paussidae, Staphylinidae, Pselaphidae, Scydmaenidae, etc.). The species are often specific in distribution, and their exact food relationships are diverse, some undoubtedly serving as scavengers, others as predators, often upon the ants and their larvae, and others as true symphiles.

7. Parasitic species.

(1) Ectoparasites (*Platypsyllus castoris* on beaver, *Leptinus testaceus* on shrews, and *Leptinillus validus* on beaver (Kellogg, 1914); three staphylinids on South American species of opossum, mouse, and guinea pig (Notman, 1923).

(2) Endoparasites (rhipophorid larvae in wasps and cockroaches).

8. Edificarian habitat (*Anthrenus scrophulariae* L. and the numerous grain and meal inhabitants). Strictly speaking, these species are living upon either dead vegetable or animal matter, and could be so classified, although the individuals are not always encountered directly associated with the organic substratum.

The species of all the remaining habitat groups may either feed directly on the substratum or be predaceous on other animals.

9. Saprobious habitat (Staphylinidæ and other inhabitants of masses of decaying leaves and grass, etc.).

10. Carpobious habitat (Nitidulidæ, Staphylinidæ, *Euphoria inda* (L.) and other species attracted by fermenting fruit, sap, etc.).

11. Xylobious habitat (Cerambycidæ, Buprestidæ, Passalidæ, mordellid larvae, etc.). This habitat merges with the dendrobious habitat, and consists of the dead and disintegrating tree as opposed to the living or dying tree.

12. Coprobious habitat (Staphylinidæ, Sphaeridiinæ, Histeridæ, Scarabaeidæ).

13. Necrobious habitat.

(1) Fresh carrion (Silphidæ, Staphylinidæ, Histeridæ, Nitidulidæ, etc.).

(2) Dry carrion (*Dermestes*, *Trox*, etc.).

(3) Bones (*Necrobia*, *Nitidula*).

Beetles are almost uniformly alate creatures, and dispersal takes place on the wing. The occurrence of individuals (1) in beach drift, (2) at light at night, and (3) on the wing is a result of this, and species belonging to any habitat may be so taken.

The wide range of the Staphylinidæ is noteworthy. Species of this family occur in all the habitats cited except the aquatic, edificarian, leaf-mining, spermobious, histobious, endoparasitic, dry carrion, and bone.

Habitats not occupied by Coleoptera. The surface of the ocean, inhabited by *Halobates* (Hemiptera), and the deeper waters of lakes, rivers, and to a slight extent, of the ocean, inhabited by dipterous and other gill-breathing insect larvae, are practically the only insect habitats uninhabited by Coleoptera. If other than insect habitats be taken into consideration, marine situations in general are uninhabited by them. Among terrestrial habitats, the rôle that beetles play as parasites is a very minor one, compared with groups like the Hymenoptera and the parasitic worms.

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THE INSECTS OF THE PANCHATANTRA

It is of interest to note that among the animal actors in the stories of the "Panchatantra," supposedly collocated in Kashmir about 200 B. C., insects play a small part. The stories have been translated recently, from the Sanskrit, by Arthur W. Ryder and published by the University of Chicago Press.

In the story entitled Leap and Creep, this and the others being Mr. Ryder's titles, Creep is a female louse living happily in the bed of a king, and Leap a flea who inveigels the louse into allowing him to sample the king's blood, the plan being for the flea to obtain his meal from the king's feet, when he was asleep or temulent. Instead of doing this, the blundering flea bit the king on the back which resulted in the sudden awakening of the king, a special search of the bed, the discovery of the louse and her family and their destruction.

In the Duel Between the Elephant and Sparrow the gnat assists by buzzing in the ear of the elephant thereby causing him to close his eyes in pleasure after which they were pecked out by a woodpecker. The frog croaking near the edge of a pit entices the elephant to the supposed water where he plunges to his destruction.

In the tale about the Unteachable Monkey a firefly is covered with dry grass and leaves and enjoyed as if it were a real fire, and in The Snake and the Ants a snake in spite of his strength and success in killing large numbers of ants is finally overcome by the exhaustless army. As in other fables, morals are pointed out; in fact the Panchatantra as a whole deals with "the wise conduct of life."—H. B. WEISS.

ON SOME COLEOPTERA IN NEW JERSEY

BY FRED M. SCHOTT

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A NEW *XYLOTRECHUS**Xylotrechus schaefferi* new species (Plate IX).

Body sub-parallel; head piceous, finely rugose, clothed with inconspicuous, grayish hairs, frontal carinae well defined, V-shaped; antennae dark brown; thorax broad as long, narrower than elytra, parallel to slightly below middle, thence constricted to base; in profile vaguely depressed and abruptly sloping near posterior margin, piceous, granulose, medially coarser, hirsute patches yellow; elytra moderately rugose, scantily clothed with prostrate pale hairs; brownish black; a short band of yellow hairs near base, a conspicuous line of yellow hairs from suture near the basal mark, curving in a deep arc across the center of elytra toward, but not quite reaching, the lateral margin; an apical transverse line of yellow from suture to near the lateral margin and thence recurved upward; apices of elytra obliquely truncate; underside piceous with grayish hairs forming bands on hind margins of segments; legs reddish brown, femoral turgidity darker. Length, 11.0 mm.; width, 3.5 mm.

A single female taken at Lakehurst, August 30, differs sufficiently from others of the genus as to warrant, I believe, specific designation. Accordingly, I propose to name it after the distinguished coleopterist, Charles Schaeffer.

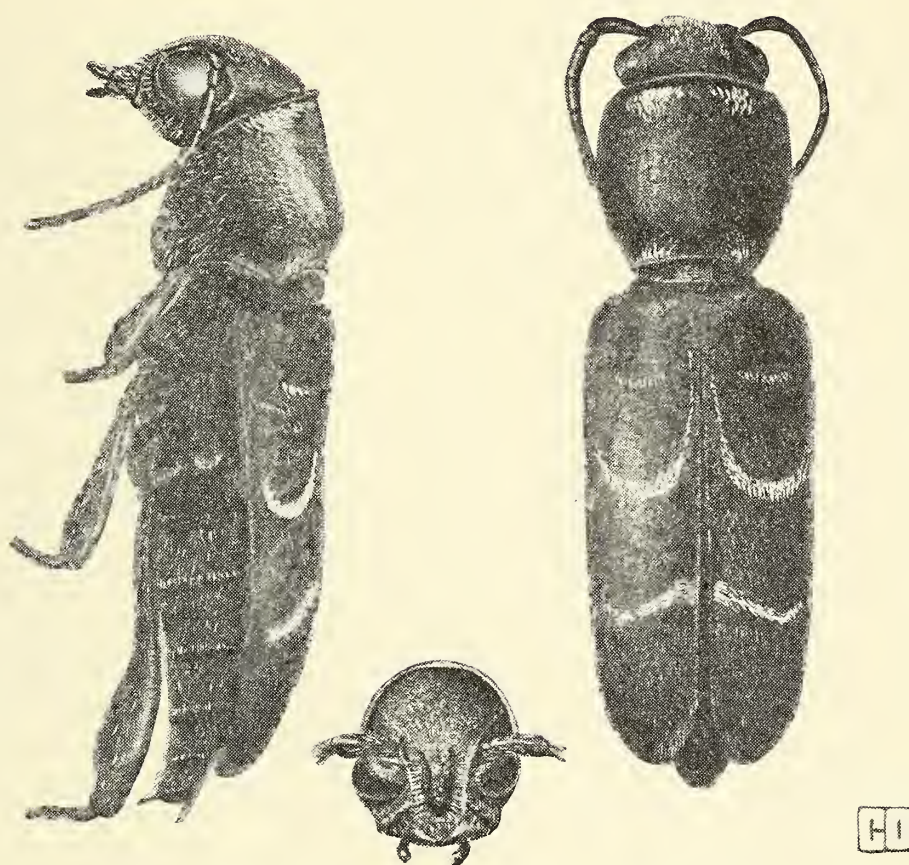
Indebtedness to H. S. Barber and W. S. Fisher is acknowledged for comparison with material in the U. S. National Museum.

DISTRIBUTIONAL NOTES

A single specimen of *Xylotrechus annosus* Say was collected at Somerville in June. The series of highlands in the northwest and north-central regions of New Jersey would seem to mark, generally, the southern boundary of distribution in any numbers of several distinctly boreal species among the Coleoptera. In June the writer spent a few days in the vicinity of High Point near the N. Y.-N. J. states line, and at Greenwood Lake. Interesting records were obtained at the first named local-

ity where the highlands rise to a height of over 1,800 feet, the greatest in New Jersey. There are about High Point a number of features that strongly suggest the higher elevations of the Catskills—in the flora for example such plants as *Clintonia borealis* and *Cornus canadensis*. On *Pinus rigida* were taken several *Ludius aereipennis* Kirby and, more commonly, *Ludius triundulatus*, Rand. also *Ludius fallax* Say; all these recorded in more northerly latitudes but not taken by the writer south of this region. One specimen of *Pheletes stigma* Hbst., recorded "New Jersey" in the Smith list, was taken. None of the above mentioned, save *P. stigma* as noted, appears in the state's published lists of insects.

At Greenwood Lake there was found an interesting color variety of *Buprestis ultramarina* Say (*salisburyensis* Hbst.) In it the brilliant blue green of the elytra in the typical form is replaced by a bright coppery tinge. A number of specimens of this color phase were taken but those of the normal green form were uncommon. It might seem as though the species is here undergoing a pigmental change due to peculiar local conditions. The writer is not aware that the unusual form has been taken in the southern pine barrens of the state, which have been the Mecca for seekers after this fine beetle. At High Point two specimens of the normal *ultramarina* were taken after considerable club calesthenics, but none of the cupreous kind.



XYLOTRECHUS SCHAEFFERI

REMARKS ON MYSCELUS EPIGONA HERRICH-SCHAFFER AND EUDAMUS CASICA HERRICH-SCHAFFER. (LEPIDOPTERA—RHOPALOCERA, HESPERIIDAE)

BY E. L. BELL

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There is in the North American Fauna a large Hesperid standing in our literature under the name of *epigona* Herrich-Schaffer, with the synonyms *epigena* Butler and *orestes* Edwards (Lintner MSS), which has been assigned by authors in their papers, to various genera, viz.: *Eudamus*, *Phoedinus*, *Thorybes*, *Achalarus* and *Rhabdoides*.

Dr. Draudt, in Seitz's *Macrolepidoptera of the World, Fauna Americana*, page 848, places *epigona* Herrich-Schaffer in the genus *Myscelus* of the *Pyrrhopyginae*, and refers to *casica* Herrich-Schaffer, in the genus *Rhabdoides* of the *Hesperiinae*, page 871, the insect that we have been calling *epigona* Herrich-Schaffer, placing as synonyms of *casica*, the two names above mentioned as synonyms of *epigona*.

Herrich-Schaffer's description of *epigona* is contained in his key to the species of the genus *Myscelus* on pages 166 and 167 of the "Correspondenz-Blatt des Zoologisch-Mineralogischen Vereines in Regensburg," Vol. 23, 1869; on page 167 is the following (translated from the German):

"b ——— in cell 1c deeply excavated, the spots of cells 3 and 4, also 6 and 7, separated only by the fine veins.

17 *epigona* HS

18 *phoronis* Hew.

19 *amystis* Hew."

The brief description in the key would, of course, be inadequate to separate from each other the three species mentioned, but it serves to show that the three were of similar shape and maculation, and in Herrich-Schaffer's opinion closely related to each other; the genus *Myscelus*, to-day, contains a number of

species of similar and peculiar appearance, quite distinct and unlikely to be confused with the species of any other genus; it seems very unlikely that Herrich-Schaffer would include with *Myscelus phoronis* and *amystis* as congeneric and of similar habitus, a species so very different in all respects as our so-called *epigona*.

Dr. Draudt, in Seitz's *Macrolepidoptera of the World*, says that *epigona* is similar to *Myscelus orbius* Mabille but more yellowish-brown, and other minor differences, perhaps a northern representative of it, from Venezuela. In the same volume of the "Correspondenz-Blatt" on page 187, Herrich-Schäffer describes *Eudamus casica* as follows (translated from the German):

"b ——— shifted towards the border, the spot under vein 2 small triangular, those of cells 2 and 3 vertical linear, 4 with a dot; underside of the hindwings with a quarter of the border white sprinkled with dark ——— 17 *casica* HS."

Herrich-Schaffer divides the genus *Eudamus* into groups and places *casica* in the second section of "Group II" with twenty-two other species, now assigned to various genera. It will be noted that, by a coincidence, both *epigona* and *casica* are number 17 in their respective groups. The above description is, of course, very brief and without locality data, but it agrees quite well with our so-called *epigona*. *Casica* seems to have been overlooked or omitted from a great deal of the literature.

Butler in *Transactions, Entomological Society of London*, Volume IV, page 493, 1870, describes *Eudamus epigena*, and gives as a reference "*Myscelus epigena* Herr.-Schaff.; *in litt*"; with "Hab. Mexico. Coll. Kaden in Coll. Druce"; again in his *Lepidoptera Exotica*, page 65, 1871, he describes *epigena* and figures it on plate XXV, figure 6; but he refers only to his first description in *Transactions, Entomological Society of London*, omitting any reference to Herrich-schaffer's description, however, immediately preceding his description, in small type, is the following comment:

"This and several other species of *Hesperidæ* have been introduced by Dr. Herrich-Schaffer into a mystical

diagnostic table, but, as he himself informs us, that he did not intend to give any descriptions ("das ich keine Beschreibungen geben wollte") it is useless for me to quote them."

It, of course, makes no difference that Dr. Herrich-Schaffer did not *intend* to describe the species included in his keys that were new to science; the fact remains that he did describe them, and these descriptions are just as valid as if it were his intention to describe them; it seems probable that when Butler wrote his description of *epigona*, in Transactions, Entomological Society of London, he confused Herrich-Schaffer's *Myscelus epigona* with some other species which Herrich-Schaffer had, apparently the species he described as *casica*, and later, when he wrote his Lepidoptera Exotica, he considered that his original description of *epigona* was valid, in the belief, that as Dr. Herrich-Schaffer did not intend to describe the species, his description would not hold.

Godman and Salvin, in the Biologia Centrali-Americana, Rhopalocera, page 332, 1893, say:

"Mr. Butler described this species as *Eudamus epigona* from a specimen purporting to be the type of Herrich-Schaffer's *Myscelus epigona*."

This seems to imply that there was some doubt in their minds that the description was drawn from the type of *epigona*; they place it in the genus *Rhabdoides*, as *epigona* Herrich-Schaffer with *epigona* Butler as a synonym.

Lintner, Entomological Contributions, no. IV, June, 1878, pages 69-70, (30th Annual Report of the New York State Museum of Natural History, for the year 1876), publishes a description of *Eudamus epigona* Butler from a pair of specimens in the collection of Mr. Otto von Meske, from Bastrop, Texas, and makes this statement in regard to *orestes*:

"In the belief that the insect was new to science, it was described by me as *Eudamus Orestes*, for publication in the 28th N. Y. Mus. Report, then passing through the press; but in the necessitated printing of the report at an earlier date than was anticipated, the description could not (together with other papers in readiness) be

given place. Hence, the erroneous reference made to *Orestes* on page 58 of Edwards's Catalogue of the Diurnal Lepidoptera of North America.

"Subsequently, Mr. W. H. Edwards identified the species with a figure of Butler in his Lepidoptera Exotica."

From the facts as they stand, the name *epigona* Herrich-Schaffer is not justified for the species in the North American fauna and should be dropped, and for it substituted, *casica* Herrich-Schaffer, following Dr. Draudt.

As mentioned before the species has been assigned to various genera by authors but for the purpose of this paper we follow Dr. Lindsey, University of Iowa Studies (Hesperoidea of America North of Mexico), Vol. IX, no. 4, pages 28-29, 1921, who places it (as *epigona*) in the genus *Achalarus*. The usual records of *epigona* undoubtedly refer to *casica*, as do those of *epigena*, though there are many records of its distribution the following will suffice as they cover all of the recorded localities known to the writer:

SKINNER, Trans. Amer. Ent. Soc., XXXVII, 3, 185, 1911; "Arizona, Southern Texas, Mexico, Guatemala."

MABILLE, Genera Insectorum, Lep. Rhop., page 29, 1903; "Colombie."

GODMAN and SALVIN, Biologia Centrali-Americana, page 332, 1893; "Very little is known of the species in Mexico, whence the type is said to have come, but across our border in Texas and Arizona it appears to be fairly numerous. The Mexican domicile of the species is fully confirmed by a specimen captured by Mr. H. J. Elwes at Orizaba, and, moreover, its extension southwards is proved by a specimen taken by Mr. Champion at San Gerónimo in Guatemala, and one sent us from the Valley of the Polochic."

Draudt, in Seitz, states that it is found from Arizona to Colombia. The specimens in the collection of the writer are all from southern Arizona: Paradise, May, June (Duffner); Tucson, Baboquivaria Mountains, June, July (Poling).

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DRAUDT. Seitz Macrolepidoptera of the World. American Fauna, page 848, 1921; page 1003; plate 164g.

Achalarus casica.

HERRICH-SCHAFFER. Correspondenz-Blatt des Zoologisch-Mineralogischen Vereines in Regensburg, Vol. XXIII, no. 12, page 187, 1869 (No. 17). (*Eudamus.*)

KIRBY. A Synonymic Catalogue of Diurnal Lepidoptera, page 578, no. 6, 1871. (*Æthilla.*)

DRAUDT. Seitz Macrolepidoptera of the World. American Fauna, page 871, 1922; page 1048; plate 169b. (*Rhabdoides.*)

Achalarus epigena.

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Lepidoptera Exotica, page 65; plate 25, figure 6, 1871. (*Eudamus.*)

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EDWARDS. Transactions American Entomological Society, Vol. VI, page 58, 1877 (Catalogue of the Diurnal Lepidoptera of America North of Mexico). (*Eudamus.*)

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DYAR. Journal New York Entomological Society, XIII, page 115, 1905. (*Phædinus.*)

HOLLAND. Butterfly Book, page 325; plate XLVIII, figure 13, 1914. (*Thorybes.*)

Achalarus epigona.

AUCT. (Not Herrich-Schaffer.)

GODMAN AND SALVIN. Biologia Centrali-Americana, page 332, plate LXXX, figures 9, 10, 11; 1893. (*Rhabdoides.*)

SKINNER. Synonymic Catalogue of the North American Rhopalocera, page 97 (no. 627), 1898. (*Eudamus.*)

DYAR. Bulletin 52, U. S. National Museum (List of North American Lepidoptera), page 58 (no. 592), 1902. (*Thorybes.*)

MABILLE. Genera Insectorum, Lepidoptera Rhopalocera, page 29, 1903. (*Rhabdoides.*)

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COCKROACHES FOR TETANUS AND INDIGESTION

In the New York *Tribune* for January 3, 1886, under the title "The Creole Doctor," Lafcadio Hearn wrote entertainingly of the curious medical recipes of Louisiana negroes. Among the various remedies for diverse ills, mention is made of cockroach tea for tetanus, supplemented by a poultice of boiled roaches over the wound, and of cockroaches fried in oil with garlic for indigestion. Hearne writes of the "amazing" size of *Blatta orientalis* in Louisiana and the few that would be required for a large plaster, but such an adjective would hardly apply to *orientalis* and it is quite likely that some other species is meant. Hearn's newspaper articles have been collected by Albert Mordell and published recently by Dodd, Mead and Company, under the title "Occidental Gleanings."—H. B. W.

NEW SPECIES AND VARIETIES OF NORTH AMERICAN CASSIDINI (COLEOPTERA, CHRYSOMELIDAE).

BY CHAS. SCHAEFFER

BROOKLYN MUSEUM, BROOKLYN, N. Y.

In comparison with Central America or even Europe the Cassidini are poorly represented in North America and with the exception of *Metriona ormondensis* Blatch., which possibly is only a variety of *purpurata*, no new species have been discovered within recent years. The only additions to our fauna have been several known European, Central American and Cuban species. Recently however, Mr. H. P. Loding, of Mobile, Alabama, sent me with some other Chrysomelidæ for examination and identification a number of Cassidini amongst which I was surprised to find three distinct new species. These together with notes on some known species are described below, also some varieties of species which seemed to me to be distinct enough to be entitled to a separate name.

Chelimorpha phytophagica Crotch.

This is a distinct species and not a variety of *cassidea*. The elytra are distinctly pubescent with short, erect hairs and the prothorax more or less so; the elytral epipleuræ are more distinctly visible and at apex horizontal and rather wide and the prothorax and elytra are more shining and more coarsely punctate. It is also shorter and a little more convex than *cassidea* with the same markings, though in one male the four spots on prothorax and the basal and umbonal spots of elytra are only present.

Crotch did not mention the pubescence of elytra in his description but it is plainly visible in his types.

Judging from the description the Mexican *rugicollis* Champ. seems to be very close to *phytophagica*, though the sculpture of the prothorax in the two is apparently different.

It occurs in Arizona and Texas.

The other varieties, with perhaps the exception of *lewisi*, look distinct but do not seem to have strong enough characters, like *phytophagica*, to be accepted as good species.

Chelimorpha cassidea lewisi Crotch.

I have no specimens of this form before me, which was described from New Mexico, and though I have seen the types in Cambridge did not make any notes. However, quoting from memory alone, *lewisi* is apparently very similar to *cassidea* in size, form and markings, except that the under side and legs are more or less pale. The color is yellowish.

Chelimorpha cassidea geniculata Boh.

This Cuban insect is apparently not uncommon in Southern Florida. It is slightly more elongate and generally a little less convex than *cassidea* with the elytra duller and the spots always smaller; the underside mostly black, femora and tibiæ reddish but the former at apex and the latter at base more or less black; the elytral epipleuræ are narrow at apex as in *cassidea*.

Chelimorpha cassidea 17-punctata Say.

This form is narrower, more elongate and less convex than *cassidea* or *geniculata* with the underside and legs more or less pale and the black spots on elytra small. The elytral epipleuræ are narrow at apex as in *cassidea*. To this form I refer two specimens from Colorado, which agree with Say's description.

Physonota unipunctata quinquepunctata Melsh.

This form seems to be entitled to recognition. It has the elytra more broadly explanate in basal half than *unipunctata* and prothorax generally with three black spots and a more or less distinct spot on each elytral umbo.

Physonota unipunctata arizonæ, new variety.

Larger than *unipunctata*, form more like var. *quinquepunctata* with relatively slightly smaller prothorax and underside and legs entirely pale. Length: 11 mm.

Tucson, Arizona (O. Dietz).

***Coptocycla repudiata* Suffr.**

This Cuban insect is reported so far only from Florida but it occurs also in Alabama, where it is taken in the neighborhood of Mobile, by Mr. H. P. Loding.

***Coptocycla pinicola*, new species.**

Form of *Metriona bicolor*, but dull not shining, reddish testaceous with a very faint blackish spot in the scarcely visible discal impression or fovea on each elytron; body below black, head prosternum, ventral segments at sides and narrowly at apex and legs antennæ pale, last four joints black, third joint longer than second, equal to the fourth. Prothorax finely alutaceous, dull or feebly shining basally, laterally broadly rounded and faintly margined. Elytra alutaceous, dull, serial punctures moderate but larger than in *M. bicolor*, lateral margin deflexed and nearly as in *M. bicolor*, lateral marginal bead much stronger than in the latter species; elytral epipleuræ at apex slightly wider and less oblique than in *M. bicolor*. Claws simple, not toothed. Length: 5 mm.

Alabama: Spring Hill (Loding).

A paratype is in Mr. Loding's collection.

Mr. Loding informs me that he takes this species only on pine. From *repudiata*, the only other species of *Coptocycla* occurring in North America, *pinicola* differs in being less convex and less elongate, lateral margin of elytra less deflexed and not punctate—distinctly punctate with numerous moderate punctures in *repudiata*—the lateral marginal bead stronger, prothorax laterally more broadly rounded and elytral epipleuræ at apex less oblique and slightly wider.

***Deloyala clavata diversicollis*, new variety.**

Generally larger and paler in coloration than typical *clavata*; the large median, prothoracic spot at base generally much paler or occasionally almost absent but then two small, dark, subquadrate spots remain at base; the surface of prothorax duller than in typical *clavata* without or with very small, shining basal space. Length: 7.5 mm.

Texas: New Braunfels and Brownsville; Arizona: Prescott and Huachuca Mts.

***Metriona bicolor floridana*, new variety.**

Larger and broader than typical *bicolor* with the hyaline lateral margins of elytra wider and less deflexed; lateral impressions of elytra below the

umbo and discal fovea on each elytron relatively larger; color uniformly yellowish-testaceous above without black spots in the impressions; body below black, ventral segments at sides and apex of last narrowly pale; legs either entirely pale, or all the femora partly black. Length: 6.5 mm.

Florida: Miami (Dietz, Engelhardt); Orange Grove (Seiffert); Tampa (Engelhardt).

The larger size, more broadly expanded and less strongly deflexed lateral margins give this form a distinct appearance, but it does not seem to have strong enough characters to make it more than a variety of *bicolor*. This form is apparently closely allied to the Central American *bifossulata* and *tresignata*, but I could not satisfactorily identify either of the two with the above described insect.

Metriona marginepunctata, new species.

Yellowish or reddish-testaceous, elytra without black spots; underside and base of middle and hind femora black; anterior legs and hind tibiæ pale; last four joints of antennæ black, the preceding joints pale. Form of *bicolor* but larger and more convex, hyaline margin of elytra more deflexed and distinctly punctate, lateral marginal bead stronger, lateral impression below the umbo and discal fovea on each elytron very faint. Length: 6.5 mm.

Alabama: Spring Hill, May (H. P. Loding).

This species is of the size of the var. *floridana* described above, but the hyaline margin of elytra is less broadly expanded and more deflexed, the surface of which is distinctly punctate—impunctate in *floridana*—the lateral marginal bead of elytra is stronger and the rather deeply impressed discal and lateral foveæ of the latter are absent in *marginepunctata*.

A paratype in Mr. Loding's collection agrees in everything with the type but a third specimen, which has been collected in 1908, has the lateral margin of elytra and prothorax scarcely translucent, but otherwise has all the characters of the other two specimens.

Metriona lodingi, new species.

Color reddish-testaceous, body below black head, ventral segments at sides and apex pale, form of *bicolor* but more convex, elytra dull, not shining, the serial punctures larger, the lateral bead of elytral margin stronger, especially at or near middle, the elytral epipleuræ at apex less oblique and nearly horizontal. The prothorax is dull, especially at sides. Length: 5.5 mm.

Alabama: Chunchula, April; Spring Hill, March, Sales Nov., all collected by Mr. H. P. Loding, to whom this new species is dedicated with pleasure and of which a paratype is in his collection.

Of all the known North American species of the genus *Metriona*, *M. bicolor* is the only one with which *lodingi* possibly could be confused, from which, however, the short description will readily distinguish it. It looks very much like *Coptocycla pini-cola* described above, but that species has simple claws, is less convex, the prothorax laterally more broadly rounded and has the lateral marginal bead of elytra still a little stronger.

DISTRIBUTIONAL RECORDS OF COMSTOCK'S MEALY BUG IN NEW JERSEY

In a recent report on the "Biology and Control of Comstock's Mealy Bug on the Umbrella Catalpa," published as technical bulletin 29 of the Virginia Agricultural Experiment Station, Dr. W. S. Hough mentions its occurrence in New Jersey. As the species (*Pseudococcus comstocki* Kuw.) is not recorded in Smith's "Insects of New Jersey," a letter to Dr. Hough asking for definite locality records brought forth the information that according to the records of the Federal Bureau of Entomology, the species had been reported as follows: Bayonne, 1921, on umbrella tree and weeping mulberry; New Brunswick, 1920, on umbrella tree; Jersey City, 1918, on honeysuckle. After his bulletin was in press, Dr. Hough was informed that the species existed also at Asbury Park. To the above can be added another locality, Highland Park, August, 1925, on *Catalpa bungei*. Quite a severe infestation was noted on several trees, the bugs being very plentiful on the branches and lower leaf surfaces.—H. B. WEISS.

THE BEE, THE WASP, THE ANT, INSECTS OF THE PHYSIOLOGUS

BY HARRY B. WEISS

NEW BRUNSWICK, N. J.

The firm of George Routledge and Sons, Ltd., of London, has published recently as a part of one of their "Broadway Translations," a translation of the *Physiologus* by Mr. James Carlill and it is of interest to note the stories of the insects mentioned therein, not on account of their entomological value or absence of it, but as partly indicative of a forgotten state of thought. Mr. Carlill, who has written a scholarly and interesting introduction to his translation which is used as the basis of this article, states that the sermons of *Physiologus* concerning the animal world formed a great part of the library of Christian Europe for almost a thousand years and were read or narrated as expositions of science and of religion from the Bosphorus to Iceland, taught in the universities, quoted by popes and friars and even made visible by carvings in the interiors of places of worship.

During the time from Claudius Galenus, the Greek physician, who first established the consultation of the pulse in diagnosis and prognosis to that distinguished Italian physicist, Galileo, doctrine and not fact was considered the proper subject for meditation, and the *Physiologus* stories under the name Bestiaries were very popular in the eleventh, twelfth and thirteenth centuries, describing as they did all kinds of animals, real and fancied. These animals were treated as symbols and their peculiarities real or imaginary were spiritually applied. This is quite apparent upon reading the tales.

According to Carlill, the *Physiologus* is to be looked upon as part of Alexandrian apologetics. The tales are authoritatively quoted by the earliest Fathers from Justin Martyr onward and Origen used them in his defense of Christianity. Written originally in Greek, they appear to have been translated into Ethiopian, Armenian, Syriac and Arabic, then into Latin and the Romance languages.

The authorship is variously assigned to King Solomon, Aristotle, Tatian, Epiphanius, Basil the Great and John Chrysostom, but as a matter of fact there was no author, the Egyptian Book of the Dead and the Septuagint version of the Old Testament furnishing the substance of the stories, which were completed by wayfarers from East, South and North, carrying into the City of Alexandria the tales which they had picked up during their wanderings.

Carlill reviews the various published collections of the stories from 1587 to present times. His version in part follows that of Peters (*Der griechische Physiologus und seine orientalischen Übersetzungen*. Berlin, 1898) who in turn followed that of the three best manuscripts. Some sixty-seven tales are included, three of which deal with insects, and these are quoted as follows.

THE BEE

The wise Solomon said: "Smallest among birds is the bee, and yet its fruit is the chief among sweet things." (Sirach II, 3.)

Physiologus says that bees dwell together in a great company; they go in by one door; they work at the same work; and provide with diligence flying together and hastening to do the common toil. And—what is greater than this—they live under a king or prince of like nature with themselves; and they make no beginning of their common work nor hurry to the meadows and flowers until the king who is over them has made the beginning. They choose not the king to this honour but his overlordship comes to him by the rule and custom which the Creator set before them to guide them. Every prince has also a sting, but he is not accustomed to wound. Yet, when he turns from his way and stings, he is at once punished for his boldness; for, as soon as he wounds a man with his sting, it remains left in the wound and he himself surely dies from the pain. The bees gather honey out of plants, making use of their mouths; and they entice wax out of flowers, helping also with their feet. And the bees carry away the honey they gather, and out of the wax they build their cells with great skill; and they separate the wax as it were into holes most cunning; and they pour the honey into the holes. This at first is very clear and fluid, but

later after it has been sometime preserved in the holes becomes cooked, and is then better and thicker. And, when violent winds arise while they are away from their home, they drop down and sit on a stone or rock until the violence of the wind has abated: and then they return home to the house.

Let us consider what this means in a spiritual sense. What does this picture to our human reason? The feeble bees who dwell together in a community and carefully set about a common work are the holy souls of the sons of the Catholic and Apostolic Church. These dwell like a flock in the same Church, and engage in the same work in common, that is the holy mysteries. While also a prince, or leader, is appointed to them who is a partaker of their nature, so has God placed the Archpresbyter, who partakes of human nature as leader in his Church, so that no confusion may befall the Ordinances. This leader truly possesses a sting with which he wounds not—that is liberty, which is given by God alike to the Archpresbyter and to his disciples. Yet the Archpresbyter wounds not with the sting, that is he guards holiness with his liberty and turns not to licence.

And as the bees gather honey from the plants making use of their mouths, and wax out of the flowers making use of their feet, and carry it away and separate it and pour it out while it is yet thin, so also the holy ones of the Church pasture on the plant of God and on the holy flowers of the godly books, and collect from them the one food of spiritual sweetness.

THE WASP

Holy David struck the psalter and prophesied saying: “They have surrounded me like wasps; they are destroyed like a fire of straw.” (Ps. 118, 12.)

Physiologus teaches of the wasp that it is separated or narrowed in the middle of the body, and has not the power to breathe or to draw in the breath with lungs in the same manner as we and the beasts do. But their whole food and nourishment comes from the air; and if thou touchest one with oil, it dies readily, because the greasiness of the oil stops the natural air holes. But, if thou sprinkled the wasp with vinegar after the

oil, then its life becomes gradually kindled again, because the air passages are opened by the sharpness of the vinegar.

What spiritual truth do we learn from this? For this has not been ordered foolishly by the Creator of all things, but has been ordained for our instruction—all this the great and the small, so that, when we consider the things visible to us, we are undertaking the knowledge of the invisible. For we, in our bodies as we now are cannot attain the invisible except through the visible. For that which cannot be seen by reason of the dullness of our bodies is pictured to us as it were through a form or image of him who cares for all things which by him were brought into being.

The wasps, who are divided in the middle of their bodies and are destroyed as a fire of straw and who perish as soon as oil drops on them, are the rebellious Devils and Fiends, who are divided in the middle of the body that is, by their mutual strife; and they are badly armed for conflict, for, if only thou takest with thee oil, that is the good works full of faith and courage, so mayest thou full well engage in battle with them. For, so soon as they come near the holy oil, their teeth become blunted by thy zeal; their air passages become choked by its greasiness; and they are as dead so long as they have not their breath by thy permission. For, if thou persistest not in the anointing or pourest out vinegar while thou slackenest the vigilance of the oil, that is failest in righteousness, then are thou like to die, for their life is given to them again as the air-passages open, and they will wound thee with their sting, and deride and kill thee.

THE ANT

Solomon says in the Proverbs: "Go to the ant, thou sluggard." (Prov. 6, 6.)

Physiologus says of the ant that it has three attributes.

The first is this: As the Ants go in a single line one behind the other each one carries a grain in its mouth. And those which have no grain to carry, do not say to the others "Give us of your corn," nor do they take it by force, but they go further and find a grain for themselves.

Let both the wise and foolish virgins take notice of this.

The second attribute is this: When they store up their food in the earth, they bite the grain in two pieces so that the corn may

not sprout during the winter; and they suffer hunger thereby. And, again, the Ants know through their wisdom when it will be hot or when the moist breeze is about to wet them. If thou watchest the Ant bringing inside the grains of corn which are outside her hole, then thou mayest know that the rainy season and the winter are at hand. But, when she brings out her food from within and spreads it out, then know that it will be warm weather.

And do thou put away the words of the Old Testament from thee, that the letter may not kill thee. For Paul says that the Law is spiritual. For by considering the bare letter of the Word the Jews became hungry and slayers of each other.

The third attribute is this: The Ants often go to the field, and climb up the stem of corn, and drag down the grain. But, before climbing, the Ant scents the underpart of the stalk, and through the scent it can tell which is wheat and which is barley, and goes to the wheat and carries away the grain. Now barley is the food of cattle. For Job said: "Instead of wheat grow me barley" (Job 31, 40). Therefore fly thou the food of cattle and take the wheat gathered in the barns. For barley is like to the learning of the heretics, but the wheat is the true belief in Christ.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY

MEETING OF NOVEMBER 18, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M., on November 18, 1924, in the American Museum of Natural History, Vice-president Dr. Frank E. Lutz in the chair, with 16 members and six visitors present.

Mr. Herbert Eberle, 1592 East 12th Street, Brooklyn, was elected a member of the Society.

Mr. Roland Jackson Hunter, 636 High Street, Newark, was proposed.

Dr. W. J. Holland spoke of the early days of entomology in this country and described many of the entomologists he had known. Born in the island of Jamaica in 1848, the son of a missionary there, his earliest associations were with Philip Gosse and C. B. Adams, who visited his father and may have rocked his cradle when an infant. Later his mother encouraged his painting of butterflies, but during his college years at Amherst no encouragement was had. As pastor of a church in Pittsburgh, and especially by contact with the young missionaries trained there, the opportunity came for studying entomology. Through the assistance of Andrew Carnegie the W. H. Edwards collection was acquired. The Butterfly Book in 1898, the Moth Book in 1903, and many other publications followed. In the course of those years at the close of the last century Dr. Holland had many entomological acquaintances, Henry Edwards, Neumogen, Smith, Riley, Strecker, in this country; Staudinger, Hampson, Butler, Oberthur and others abroad, of whom he told amusing and interesting anecdotes. He told how Henry Ulke said to him "why shouldn't a man be young who studies entomology" and how Prof. Wm. T. Forbes's father blamed the Butterfly Book for spoiling the legal career he had mapped out for his son. He rejoiced in the growing importance of the science and told how he had heard a passerby describe the "State Bugger."

Mr. Leng presented Dr. Forbes's paper on the Wing Folding of Coleoptera, in which it is pointed out that the various patterns may be grouped into divisions which agree with those previously established upon other characters, viz.: Adephaga and Polyphaga primarily, and secondarily four groups of the Polyphaga. Going further it is pointed out that the relationship of some hitherto doubtfully placed forms may be determined by studying the pattern of wing folding.

Dr. Forbes exhibited by drawings he had made and by blackboard illustration the characters of each of the divisions, and discussed some of the more interesting abnormal forms. He answered a number of questions,

especially as to the mechanism of folding which he said was due to relaxation of the muscles.

Mr. Bird, Mr. Hunter, and Dr. Holland took part in the discussion that followed.

MEETING OF DECEMBER 2, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M., on December 2, 1924, in the American Museum of Natural History, President Harry B. Weiss in the chair, with 21 members and about 12 visitors present.

Mr. Roland J. Hunter, 636 High Street, Newark, was elected a member of the Society.

Mr. Andrew R. Jansen, 428 West 204th Street, and Mr. Henry Silver, 887 Crotona Park North, were proposed for membership by Mr. Mutchler.

Dr. Leonard announced that up to July 1 he would be in Ithaca editing a New York State List of Insects for which publication was assured by the College of Agriculture, Cornell University. Clerical assistance would also be furnished by the college but active cooperation in preparing the list by specialists was needed.

Dr. Sturtevant spoke on "Some Things We have Learned from a Fly about Heredity," using living specimens of *Drosophila melanogaster* and other species of *Drosophila* as illustrations. In simple language he described the fourteen years of experimental work conducted by Dr. Morgan and himself at Columbia University during which time 20,000,000 specimens had been examined under the microscope. *Drosophila* had been the main subject of investigation because its breeding every two weeks, the ease with which each brood could be studied in ½-pint milk bottles, and raised on fermenting banana (of which about three bunches a week were used) made it most suitable. As the result of breeding from the sports that arose about 400 types of variation had been found, some presenting very slight differences, others differences of remarkable character. Four of such were shown, one with white eyes which had bred true for 200 generations, one with vestigial wings, one with curled wings, and one with black wings, these being departures from the wild type, brownish in color, with bright red eyes and wings of ordinary type. All breed true.

Dr. Sturtevant then proceeded to show how heredity depends on units of the chromosomes of which a definite number are found in each cell nucleus. This number for *Drosophila melanogaster* is four; it varies in other species of *Drosophila* and other animals, and is forty-eight in man. The units also vary in form, and those that are rod-like also vary with the sex. At the request of Dr. Lutz the differences between the chromosomes of male and female were explained in detail as well as the combination that determined the sex of the offspring.

Dr. Sturtevant's remarks were discussed by Messrs. Bird, Barber, Lutz and Davis, bringing out that the speaker regarded the laboratory products as sports or mutations.

Mr. Davis exhibited typical *Cicada bonhoti* from New Providence, Bahamas, collected by Mr. Olsen and some allied forms from Andros, Cuba and Florida.

Mr. Jones spoke briefly of his visits to European museums dwelling upon the kindness and generosity of the curators he had met.

MEETING OF DECEMBER 16, 1924

A regular meeting of the New York Entomological Society was held at 8 P. M., on December 16, 1924, in the American Museum of Natural History, President Harry B. Weiss in the chair, with 15 members and four visitors present.

Messrs. Jansen and Silver, proposed at the previous meeting, were elected members of the Society.

Mr. Leng exhibited Bulletin 319 of Maine Agricultural Experiment Station on the Blueberry Beetle and some of its relatives.

The president appointed as nominating committee Messrs. Sherman, Woodruff and Sturtevant.

Mr. Davis spoke of "The South American *Cicada tibicen* with other studies in *Cicada*." He showed Meriam's work in which *tibicen* was illustrated from Surinam and the errors of Linné and others by which the locality Carolina has been misapplied. He quoted Garman as having early detected the error and emphasized the fact that *tibicen* does not occur in the United States. Six boxes of specimens illustrated the thoroughness of his studies in *Cicada*. His remarks will be printed in full.

Mr. Watson exhibited four rare and beautiful Lepidoptera donated to the Museum by Mr. Frank Johnson, three being Morphos of the *hecuba* section and one a moth, *Coscinocera hercules* from New Guinea, attaining nearly ten inches in length.

Mr. Mutehler exhibited the museum collection of the genus *Popillia* and its parasites, being a part of the Japanese Beetle exhibit in preparation.

BOOK REVIEW

Manual of Injurious Insects, by Glenn W. Herrick. Henry Holt and Company, New York, 1925.

One usually assumes that the words "injurious insects" in a book title, refer only to crop pests, but here is a book that lives up to its name and includes accounts of all major pests attacking fruits, vegetables, cereal and forage crops, stored grains, cotton, tobacco, sugar-cane, greenhouse plants, livestock, poultry, household belongings and even man. Short chapters are devoted to insect structure, losses caused by insects, insects as disseminators of plant and animal diseases, and useful insects. These are followed by longer chapters on methods and materials for insect control and then by specific accounts dealing with the important enemies of crops or groups of crops. These accounts vary in length according to the importance of the species and include descriptions of the adult, larva, injury, life history and control measures.

A very useful feature and one unusual in texts on entomology is the number of maps showing the distribution of various species, there being over 100 of such illustrations. Another valuable integrant also usually missing in other text books is the synopsis found at the end of each group of crop pests, wherein the various species are grouped according to their habits of attack and accompanied by information that enables one to identify the species at fault with a fair degree of certainty. These synopses or "keys" are so worded that they can be used easily by one having little or no knowledge of entomology.

The entire book is illustrated copiously by good drawings and photographs. The accounts are abreast of the times and recent discoveries and usages are included. It should serve admirably as a school text, as a reference work for economic entomologists, growers of fruit, vegetables and other crops and as a general book on many phases of economic entomology.—HARRY B. WEISS.

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Generic names begin with capital letters. New genera, subgenera, species, subspecies, varieties and *nomina nova* are printed in italics.

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